Designing the Transition

SEVEN DESIGN PERSPECTIVES TO BUILD CAPACITIES FOR PEOPLE, ORGANISATIONS AND ECOSYSTEMS

Paola Bertola, Carmen Bruno, Erminia D'Itria, Silvia Maria Gramegna, Francesca Mattioli, Michele Melazzini, and Xue Pei

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The chapter presents the rationale behind the conception of the ECODeCK project in relation to the challenges posed by the sustainable transition of the manufacturing sector. The project ECODeCK is rooted in the assumption that design practice and design research can play a crucial role in fostering sustainable transition, a word often used as a marketing claim rather than a primary value to inform production strategies. More specifically, ECODeCK is grounded in the idea that design can be a powerful cognitive tool to connect people, organisations and ecosystems. The chapter introduces a design-led approach of building capacity for sustainable transition that engage three different levels: (I) on human and people level by fostering their sustainability competences development, (II) on organization level by informing new strategies to cope with sustainable transformation, (III) on ecosystem level by contributing to support the development of effective entrepreneurial ecosystem and policies. ECODeCK proposes to leverage the interconnection of these levels to foster a paradigmatic change about sustainable transition through project-based learning training. The solution-oriented and pragmatic approach char-

acterizing designerly ways of thinking becomes the enabling factor for trainees to face sustainability challenges, envision new production ecosystems and inform collective actions within and beyond their organisations.

1.1 Introduction: Systemic Changes Towards Sustainability in the Italian Manufacturing Sector

Like other national systems in the Global North, the Italian manufacturing sector has consolidated the *Made in* label as a mark of value, particularly through its emblematic fashion and furniture industries. Historically rooted in artisanal excellence and global export leadership, these sectors now find themselves at a critical crossroads, facing mounting environmental, social, and regulatory pressures that demand profound transformation (D'Ascenzo *et al*., 2025). In this context, proposing ECODeCK within the fashion and furniture domains of Made in Italy is both strategically relevant and symbolically resonant. The Italian fashion industry – globally influential and economically significant – is increasingly scrutinized for its environmental footprint. According to the United Nations Environment Programme, it contributes up to 10% of global carbon emissions and 20% of global wastewater (UNEP, 2019). Italy occupies a leading role in global fashion production, representing the country's second-largest industry by productivity, export volume, and total turnover. The sector comprises approximately 60,000 enterprises and employs around 600,000 individuals (Camera Nazionale della Moda Italiana, 2025). By contrast, the Italian furniture sector, renowned for its regional craftsmanship and heritage brands – particularly in areas such as Brianza and Veneto – confronts a different type of challenge: cultural inertia and resistance to change. With more than 21,000 manufacturing companies and a total turnover nearing €27 billion in 2022 (FederlegnoArredo, 2016), the sector epitomizes Italy's artisanal pride. However, sustainability-oriented transformation is often perceived as a threat to the authenticity and identity of traditional production practices. Despite its strong

export performance and aesthetic leadership, the sector's innovation efforts frequently remain confined to incremental adjustments or superficial *greenwashing* (Julier, 2013). Nonetheless, evolving European Union regulations, such as the Ecodesign for Sustainable Products Regulation (ESPR), alongside rising consumer demand for transparency and circularity, are compelling even the most traditional actors to reconsider their practices. The imperative for a sustainable transition in manufacturing has intensified, as businesses are increasingly required to adopt development models that move beyond linear, resource-intensive systems. Sustainability is no longer merely a matter of compliance, but has emerged as a strategic imperative and a source of competitive advantage. However, this transition is complex. Conventional design practices – often centered on aesthetics and product-level innovation – have limited capacity to address the systemic and multidimensional challenges posed by sustainability. To be effective, design must evolve to encompass broader systemic concerns such as circular economy integration, stakeholder collaboration, and long-term value creation. While some Italian manufacturers have adopted promising practices, many continue to operate within early-stage, compliance-oriented models, focused more on adhering to standards than on rethinking production and consumption paradigms (D'Itria *et al*., 2024; Davelaar, 2021; Gaziulusoy & Erdoğan, 2019). This situation underscores a cross-sectoral need for new tools and frameworks capable of fostering transformative change. The ECODeCK project responds to this need by reinterpreting design as a lever for systemic innovation, promoting a shift from isolated initiatives to integrated, multi-level capacity-building. It offers a compelling opportunity to support sustainable innovation not merely as a regulatory obligation, but as a transformative force. ECODeCK's systemic design approach is particularly well-suited to both sectors. In fashion, it facilitates urgent environmental adaptation through collaborative, regenerative strategies. In furniture, it provides a cultural reframing, positioning sustainability not as a rupture with tradition, but as its natural evolution. By engaging stakeholders in processes of shared inquiry and systemic learning, ECODeCK offers a platform that reconciles sustainability with the enduring values of Made in Italy – aligning cultural heritage with forward-looking innovation.

1.2 The Rationale Behind ECODeCK Project

The ECODeCK project was conceived in response to the urgent need for sustainable transformation within Italy's manufacturing sectors, particularly fashion and furniture, two pillar sectors of the *Made in Italy* identity, deeply embedded in local craftsmanship, design culture, and global markets (Fornasiero & Tolio, 2024; Coltorti, 2013). Recognising the limitations of conventional design approaches rooted in object-making and product aesthetics, ECODeCK embrace design as a systemic process capable of enabling organisational transformation, stakeholder collaboration, and innovation ecosystems. Indeed, design has evolved from a discipline focused on the creation of physical artefacts and visual communication into a strategic practice addressing complex systems, human interactions, and cultural transformation. Richard Buchanan in 1992 mapped this shift with his *Four Orders of Design*, which expanded the scope of design from symbols and things to actions and systemic environments (Buchanan, 1992). This reconceptualisation moved design from being artefact-centred to engaging with social practices, institutions, and broader societal challenges. As Manzini in 2015 stated, the designer's role becomes a facilitator of social innovation, focusing on collaborative processes that empower communities to co-create solutions (Manzini, 2015). Other scholars further critique fixed, linear models of design, instead framing it as a dynamic and situated practice shaped by institutions, cultures, and evolving societal needs (Kimbell, 2011). This evolution of design practice is deeply intertwined with the increasing complexity of the sustainable transition. As sustainability challenges (climate change, social equity, ecological resilience) require systemic, participatory, and adaptive responses, design provides a framework not just for problem-solving, but for reframing and reshaping the relationships between people, technologies, and ecosystems (Chick, 2012). The discipline's shift reflects its growing relevance in orchestrating the transition toward more sustainable, inclusive practices and actions. The ECODeCK project embraces this shift in perspective: from design as a solution to individual problems, toward design as a cognitive and strategic tool for navigating complexity and activating long-term change. ECODeCK bridges knowledge, skills, and transformation by

integrating research-driven frameworks, applied methodologies, and training interventions to support professionals and organizations in developing the competencies needed to adapt, innovate, and thrive in the face of sustainability challenges. Through this lens, the design process can be framed as a vehicle for capacity building, aligning innovation with ecological regeneration, and socio-economic resilience. The *designerly way* (Cross, 1982) offers a distinctive epistemology that complements scientific and engineering approaches by emphasizing problem framing, creativity, and iterative prototyping as means to address complex challenges. In the context of sustainability, this approach enables the development of simple yet effective tools and methods that help designers navigate and communicate systemic complexity (Cross, 2001; Buchanan, 1992). Unlike conventional training programs that often prioritize linear problem-solving or static knowledge transfer, the hands-on and iterative nature of design fosters future-oriented thinking by envisioning alternative scenarios and creating novel value propositions (Liedtka, 2015). Creativity, a core element of design practice, plays a transformative role in shaping shared and desirable futures aligned with sustainability transitions (Mulgan, 2018). Design researchers and practitioners introduce diverse perspectives that differ from traditional disciplinary roles, thereby fostering more holistic and systemic approaches to planning and implementing sustainable innovation (Manzini & Rizzo, 2011). This orientation helps reduce uncertainty and perceived risk, supporting the co-creation of context-sensitive, innovative pathways for change (Calvo & Sclater, 2021). Moreover, design's inherent focus on visualization and communication enhances the ability to surface and interpret the layered complexities associated with sustainability transitions, particularly in industrial contexts (Sevaldson, 2011). Design practices such as storytelling, scenario building, and visual prototyping engage stakeholders emotionally and cognitively, creating shared understanding and fostering commitment to collective action. These attributes make design a powerful enabler of bridging knowledge and skills for fostering organizational and systemic transformation towards sustainability.

1.3 Design for Sustainable Transition Through Capacity-Building

Design-based education and capacity-building are increasingly recognised as pivotal for driving sustainability transitions, moving beyond conventional approaches to foster deep, systemic change. This perspective acknowledges that academia is embedded within broader socio-ecological systems and is responsible for actively contributing to transformation. The inherent nature of design, as both a field of knowledge and research, is uniquely positioned to innovate instructional practices and cultivate sustainability competencies through hands-on learning. A core strategy for this educational shift is the adoption of Project-Based Learning (PBL), often encapsulated within Design-Based Learning (DBL). DBL is a well-established pedagogical approach in design education where learners construct knowledge, skills, and abilities by self-directing the process of creating solutions to real, open-ended, and ill-defined design problems within a situated context that aims to recreate real-world interactions (Mattioli, 2022). This approach naturally promotes a constructivist, self-regulated, situated, and collaborative learning paradigm (De Corte, 2010; Mattioli, 2022), emphasising that knowledge is built through direct experience and mindful interactions with others and the environment. The experiential and authentic nature of DBL environments makes it particularly effective for fostering holistic competence development, aligning seamlessly with the demands of sustainability education. Crucially, this pedagogical framework enables embracing uncertainty through designerly ways of thinking. Design intrinsically provides an orientation toward *wicked problems* – complex issues with no single solution – and offers the proficiency to manage uncertain and intricate situations characteristic of sustainability challenges. The iterative process inherent in design, involving testing, experimentation, feedback, and refinement, directly mirrors the uncertain and evolving nature of sustainability outcomes. Learners in design-based learning are encouraged to be flexible and adaptable, continuously acquiring new knowledge and skills as they iteratively refine their problem perceptions and solutions. The value of experiential, problem-based training approaches

is underscored by constructivist learning theories, which assert that competence develops through direct experience and active engagement. In design-based learning, this translates to a *learning-by-doing* principle, where learners acquire design competence through hands-on experience with the design process. This active engagement acts as a learner-motivated activity, leading to integrated outcomes and sustained participation, fostering self-regulated learning as students acquire knowledge and skills to address the initial design problem. Educators facilitate this by posing problems that trigger inquiry, reasoning, and the creation of innovative solutions. Furthermore, sustainability education benefits immensely from participatory and non-linear learning. A socio-constructivist view, central to effective ESD, rejects the notion of passive learners, instead positioning them as active agents who co-construct knowledge through meaningful participation and shared experiences. Design-based learning, with its emphasis on collaboration, provides a relevant interactional and contextual opportunity for students to develop intercultural and social competences. This collaborative learning fosters a deeper understanding of diverse perspectives and enables collective problem-solving, which is essential for defining solutions to complex sustainability problems. The non-linear nature of these processes reflects the reality that knowledge creation and application are not sequential but rather involve continuous interaction and re-evaluation. This dynamic approach encourages diversity, heterogeneity, and the formation of creative knowledge environments. Effective design-based education for sustainability transitions should target three-impact levels of a systemic transition: individuals, organizations, and ecosystems. At the individual level, the goal is to cultivate sustainability competence. Competence is the capacity to mobilise relevant knowledge, skills, and attitudes, understood within a given value framework, to respond appropriately and effectively to sustainability challenges. Sustainability competences are those competencies needed to confront sustainability issues. Capacity building primarily aims to stimulate participants' competence acquisition to inform their actions. From this conception, capacity building can become a key for employee training to develop sustainability competences. Thus, this capacity can leverage employee growth, engagement and empowerment. Design-based capacity building can become the means to con-

nect sustainability values to actions, concretely bridging abstraction to concreteness. Also the learning-by-doing approach intrinsic to DBL, if consciously designed according to a sound understanding of the guiding competence framework, can become a key to holistically consider all the competences needed to guide increasingly sustainable actions. For organizations, design-based capacity building aims to enable strategic sustainability shifts by fostering the competencies needed for socio-ecological transformation within their human capital. Projects like ECODeCK focus on building capacity for cross-departmental employee groups within manufacturing companies, promoting a broader understanding of organizational practices, opportunities, and constraints for sustainable action. Design capabilities can enhance individual creative confidence and engagement when embedded in human resources practices, driving organisational cultural change. This approach equips firms to integrate diverse knowledge sources, navigate technological complexity, and foster cross-organizational collaboration for sustainability-oriented new product development. At the broadest level, design-based education contributes to systemic innovation and policy development, as conceptualized by the Quintuple Helix innovation model. This model highlights that the natural environment acts as a crucial driver for knowledge production and innovation, creating incentives for sustainable development across society. Investments in the education system (human capital) lead to new knowledge being fed into the economic system, stimulating the growth of a *green economy*, creating new jobs, and sustainable economic growth. This, in turn, influences the natural environment by promoting protection and regeneration. The continuous circulation of knowledge through various societal subsystems, including media and political systems, supports establishing a *knowledge-based democracy* and promotes informed political citizenship.

1.4 Conclusion: Towards a Design-based Culture of Sustainability

ECODeCK envisions a future where design operates not as an auxiliary function, but as a central driver of collective action towards sus-

tainability. Thus, design transcends its traditional role of knowledge transfer to become an enabler of transformation, fostering critical thinking, participatory processes, and context-sensitive innovation. Rather than delivering static solutions, design becomes a dynamic method for sensemaking, empowering individuals and organizations to reframe complex challenges and co-create systemic responses. By emphasizing design's relational and ecosystemic dimensions, ECO-DeCK promotes a cultural shift that embeds sustainability into the core of industrial practice, education, and policy-making. Sustainable transition represents a multifaceted and long-term endeavor. Within this context, the proposal of a design-based capacity-building project emerges as a promising pathway to bridge the current gap between design research and sustainable development practices. The ECO-DeCK project exemplifies how design can serve not merely as a problem-solving tool, but as a strategic and transformative approach that enables industrial sectors to build the necessary capabilities to generate sustainable solutions over time. Rather than prioritising rapid solutions and outcomes, this perspective emphasizes the importance of long-term capacity building and the features of a design-based approach to doing so. The design-based approach fosters the development of flexible, context-sensitive, and resilient solutions that can respond to the evolving challenges of sustainability. Shifting the focus from traditional education and training toward capacity-building reflects a more systemic and empowering approach that equips individuals, organizations, and communities with the competencies needed to actively shape their sustainable futures. However, implementing design-based capacity-building within industrial contexts involves several challenges. Integrating design methods into existing production systems and aligning them with regulatory and institutional frameworks requires careful deliberation and collaborative effort. A key barrier lies in the need to articulate and demonstrate the tangible benefits of design interventions in ways that resonate with business and policy stakeholders. Furthermore, while design practice often operates within short- to medium-term project cycles, sustainability transitions demand a strategic orientation toward long-term goals and intergenerational impacts. Therefore, in this book, the ECODeCK project has involved diverse perspectives and areas of design in

promoting a design-based culture of sustainability through capacity building. An essential objective of the ECODeCK project is the educational mission of academia. Within a broader vision of education for sustainable transition, universities and research institutions must evolve from knowledge providers to active agents of transferring the knowledge to activate and foster the transformation. The responsibility of academics, particularly in the design field, is to craft learning environments that extend beyond the classroom, engage real-world contexts, and create instructional design as a form of design to support the learning process. The pedagogical structure of the ECODeCK training model ensures that the capacity-building actions are grounded in real contexts and adaptable to the diverse learning needs in complex industrial systems. At the core of the project lies a strategic and systemic vision of design, particularly a strategic design approach. Sustainable development requires moving beyond firm-centric innovation and toward value co-creation across extended ecosystems. By emphasizing the importance of collaboration between firms, institutions, and actors, the ECODeCK project included the strategic design approaches and methods to position design as a driver to build collaborative strategies and capacities across the value chain. ECODeCK project promotes the necessity of developing ecosystem-level strategies, where design supports cross-boundary learning, stakeholder engagement, and shared responsibility. To leverage the collaboration among diverse actors, it is essential to emphasize the unique role of participatory design within the ECODeCK project. Participation is not a methodological option but a foundational principle that enables transformation to be inclusive, situated, and meaningful. Co-design practices and dialogic learning within the ECODeCK project ensure that design interventions are co-produced and rooted in the lived experiences, cultural contexts, and collective intelligence of diverse stakeholders. Introduction of the concept of regenerative creativity offers a complementary perspective, a forward-looking redefinition of creativity that shifts from problem-solving to systemic regeneration. This design approach advocates a paradigm of change that restores ecological and social systems while transforming human values. Creativity, in this sense, becomes a distributed and collaborative process, not confined to innovation

labs or artistic expression, but embedded in how organizations and individuals envision futures and act upon them. Transforming practices also requires internal cultural change, in which the role of design could play in reshaping organizational culture towards sustainability. The concept of *design culture* explains how design interventions can gradually realign an organisation's culture with sustainability principles by operating across individual, team, and organizational levels. This design approach guarantees that ECODeCK fosters transformation not as a top-down mandate but as a participatory and engaging process. The sector-specific lens and knowledge are necessary to bring systemic changes to tangible practices through design. The contradictions between traditional mass production and sustainability imperatives in the fashion and furniture sectors advocate for a shift toward circularity, social equity, and responsible innovation. Design serves as both a practical and symbolic tool for enabling new production systems while also reshaping the narratives and cultural meanings that sustain overconsumption. Particularly, the fashion sector could act as a laboratory for testing how design-driven education and systemic thinking can challenge entrenched industrial norms. This enables the ECODeCK project to translate conceptual transformation into the development of concrete design actions and strategies capable of reorienting practices within manufacturing sectors. The ECODeCK project embraces a design-driven approach that is both pragmatic and future-oriented. By leveraging the strategic role of design, it fosters cross-disciplinary collaboration, engages stakeholders, and supports transformative processes across the manufacturing ecosystem. Through the integration of design into capacity-building initiatives, ECODeCK nurtures a sustainability-oriented mindset, equipping organizations to navigate complexity, respond to emerging challenges, and generate long-term value. In doing so, it contributes to building more resilient, inclusive, and sustainable models of production. The following chapter delves into the theoretical foundations that inform this approach, presenting the key results and conceptual frameworks that shape the ECODeCK capacity building model.

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2. ECODeCK Project

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This chapter discusses the key outcomes of the ECODeCK project, with particular emphasis on the conceptual foundations that inform its capacity building model. It first introduces the Sustainable Transition Comp (ST Comp), a competence framework specifically developed to support sustainability training in the manufacturing sector. Adapted from the European Joint Research Center's Green Comp framework, ST Comp articulates the core competencies and skills required to enable sustainable transformation. The chapter then examines the Design for Sustainability (DfS) framework, which highlights the strategic role of design in advancing sustainability-oriented innovation within manufacturing systems. Together, these two frameworks constitute not only the practical foundation but also the theoretical scaffolding within which the ECODeCK capacity building model has been conceived and developed. Far from being a merely operational tool, the model represents a structured theoretical construct – an educational framework grounded in design-based and Transformative Learning principles. It seeks to equip individuals and organizations with the competencies, behaviours, and mindset

necessary to navigate the complexities of sustainable transitions and drive systemic change across the manufacturing ecosystem.

2.1 Introduction: From Vision to Research Actions

The ECODeCK project was conceived from the ambition to reposition design as a central transformative force capable of guiding sustainable transitions within manufacturing ecosystems. Its primary objective is to build capacity for sustainability by equipping professionals, organizations, and territorial systems with the competencies, strategies, and tools needed to navigate in addressing complex socio-environmental challenges. The project was developed by seven design researchers from the Department of Design at Politecnico di Milano, drawing upon their diverse design backgrounds and expertise. The project emerged through a collaborative process of identifying shared research interests and complementary areas of specialization, with the aim of contributing to knowledge generation of Spoke 2, Eco-Design strategies: from materials to Product Service Systems – PSS, of the national research initiative MICS – Made in Italy Circolare e Sostenibile. ECODeCK draws strength from the convergence of these diverse yet complementary design perspectives, which collectively build a foundation for contributing to the complex challenge of enabling a sustainable transition within manufacturing industries. The multidisciplinary approach of the ECODeCK project integrates design researchers with diverse backgrounds, from strategic and product design to co-design and participatory design, to design and creative methods for envisioning, as well as design education and sustainability studies for transformation. This diversity enriches the project's capacity to address the multifaceted nature of sustainable transition, creating a rich tapestry of perspectives that enhances its capacity to tackle sustainability in a holistic manner. ECODeCK combines theoretical inquiry with applied experimentation through a research-through-design methodology. The process unfolds across interlinked phases: mapping and analysis of the current state of sustainability in the Italian fashion and furniture sectors, development of

conceptual frameworks, co-design of training modules, and prototyping of educational interventions in collaboration with SMEs. This iterative and participatory process ensures that the project remains grounded in real-world contexts while advancing theoretical contributions to design for sustainability. Recognizing the urgent need to address complex socio-environmental challenges, ECODeCK aims to build capacity for sustainability by equipping professionals, organizations, and territorial systems with the necessary competencies, strategic frameworks, and practical tools (Peiró *et al*., 2021). The ultimate goal is to enable these actors to navigate the multifaceted challenges of sustainability transitions effectively and to lead meaningful change within their respective contexts. This ambition reflects a shift from perceiving design solely as a tool for product development toward understanding design as an agent of systemic transformation, capable of influencing socio-technical, organizational, and cultural dimensions within manufacturing industries (D'Itria, Pei & Bertola, 2024; Bertola & Colombi, 2024; Vezzoli & Macrì, 2024; Scoones *et al*., 2020; Ceschin & Gaziulusoy, 2019; Chick & Micklethwaite, 2011).

Design training and collaborative practices constitute another fundamental area, focusing on the development of human and organizational capabilities necessary to embed sustainability principles effectively. By fostering skills and cultivating collaborative mindsets, these practices help ensure that sustainability becomes an integral part of organizational culture and everyday decision-making processes (Mardikaningsih, 2024). Strategic design provides a critical link between design, business, and innovation management, aligning sustainability objectives with organizational goals, market strategies, and value creation. This approach facilitates embedding sustainability into the core business models and enhances the viability and competitiveness of companies pursuing sustainability transitions (Moore & Manring, 2009). Finally, service and systemic design broaden the scope of inquiry from isolated products to complex service ecosystems and interconnected industrial networks. This systemic lens acknowledges the interdependencies within value chains, policy environments, and societal infrastructures, highlighting the importance of multi-actor collaboration for scalable and lasting impact (Schwaninger, 2018). Co-design and co-creation emphasize participatory approaches

engaging multiple stakeholders to foster shared ownership and social legitimacy of sustainability initiatives (Hakio & Mattelmäki, 2019). Such methods ensure that solutions are socially embedded and contextually relevant, vital for the acceptance and success of sustainable transitions. Another important dimension is design for transformation, which positions design as a catalyst not only for incremental improvements but for deep, systemic change within organizations and broader societal structures (Gaziulusoy & Erdoğan Öztekin, 2019). This perspective underlines the potential of design to disrupt established patterns, reshape values, and promote long-term sustainability objectives beyond mere product innovation. Complementing this, design methods for envisioning support strategic foresight and future-oriented thinking, enabling organizations to anticipate emerging challenges and opportunities, and to creatively navigate uncertainty in transition pathways (Breuer, 2023). Within the fashion design for sustainability dimension, the project addresses a sector known for its significant environmental and social impacts, emphasizing material innovation, ethical production, and consumer behavior transformation as crucial levers for change (D'Itria, 2025; Bertola & Colombi, 2024). This rich diversity of disciplinary backgrounds and approaches significantly strengthens the ECODeCK project's ability to address the multifaceted and layered challenges inherent in sustainable transitions. The integration of these perspectives enables a comprehensive understanding of sustainability as an evolving process that requires coordinated interventions across product, organizational, and systemic levels. ECODeCK employs a research-through-design methodology that combines rigorous theoretical inquiry with applied experimentation. This approach allows the project to bridge academic knowledge and practical innovation effectively (Zimmerman *et al*., 2010). The research unfolds through a series of interlinked and iterative phases, beginning with the systematic mapping and analysis of the current state of sustainability practices within the Italian fashion and furniture manufacturing sectors. This empirical groundwork informs the development of conceptual frameworks that define the key competencies and strategic orientations necessary for sustainability-oriented transformation. These frameworks draw inspiration from existing European models, in particular the GreenComp – the European Sustain-

ability Competence Framework – promoted by the European Commission's Joint Research Centre[1]. By adapting and contextualizing GreenComp to the specific challenges of the manufacturing sector, the ECODeCK team has developed a competence-based foundation tailored to the realities of industrial transition. These conceptual frameworks serve as the foundation for the capacity building model developed by the ECODeCK team. Far beyond a traditional knowledge transfer approach, this model is designed to foster transformative learning processes that enable individuals and organizations to engage with sustainability transitions through critical awareness, systemic thinking, and strategic foresight. Its development follows a collaborative co-design approach, in which participants actively interact and support one another to build a shared understanding of their system. This means that the development process is not one-directional, where knowledge is simply transferred from experts to participants, but rather a dynamic and interactive process where all stakeholders, including small and medium-sized enterprises (SMEs), contribute actively to the co-creation of knowledge, continuously learning and adapting to the system and emerging challenges. This approach promotes self-organization and the evolution of the system itself. In this process, companies are not passive recipients but active participants who integrate and adapt the project's insights and resources in ways that align with their unique contexts. This allows each organization to preserve its operational autonomy while engaging in a dynamic system of mutual exchange. The ECODeCK team facilitates and mediates these interactions, ensuring that the co-design process supports organizational learning, contextual adaptation, and the emergence of shared, practice-based knowledge. Through reciprocal interactions among the organization's members and resources – facilitated and mediated by the ECODeCK team – companies are empowered to adapt and synthesize the training content in ways that resonate with their unique contexts and needs. This dynamic interplay ensures that the solutions are not externally imposed but emerge organically within the organization, fostering deeper engagement, ownership, and sustainable capacity building. This participatory and cyclical process guarantees that ECODeCK remains firmly grounded in tangible industrial and territorial contexts, while simultaneously contributing

Note 1. https://op.europa.eu/it/publication-detail/-/publication/bc83061d-74ec-11ec-9136-01aa75ed71a1

to theoretical advancements in the field of design for sustainability. Through this integrative and comprehensive approach, ECODeCK aims to empower professionals and organizations to become proactive agents of change, equipped to lead their industries toward a more sustainable and resilient future.

2.2 The Design for Sustainability (DfS) Framework

The Design for Sustainability (DfS) framework constitutes the first fundamental theoretical outcome of the ECODeCK project's conceptual apparatus. Its significance lies in offering a comprehensive and systematic approach to understanding how design can actively facilitate sustainability transitions within the manufacturing sector. Recognizing the complexity and multifaceted nature of sustainability challenges, the framework serves as a crucial tool to map the diverse ways design interventions can create value and promote sustainable innovation. By articulating progressive levels of engagement, the DfS framework not only guides practitioners and organizations in integrating sustainability into their design processes but also lays the theoretical foundation upon which the project's capacity building model is constructed. The first level, *Insular Sustainability*, focuses on technical solutions and product-level improvements, such as material efficiency and low-impact production. The second, *Responsible Sustainability*, incorporates broader business models and stakeholder perspectives, promoting ethical practices and inclusive innovation. The third and most advanced level, *Ecosystemic Sustainability*, emphasizes multi-actor collaboration, regenerative design principles, and contributions to policy and systemic change. The framework is theoretically grounded in systems thinking and transition design, and is visually represented to illustrate the layered, interdependent nature of sustainable design actions. Through this lens, the DfS framework identifies a spectrum of design actions: from optimizing product lifecycles and enabling user awareness to fostering inter-organizational collaboration and shaping sustainability – oriented narratives – offering a strategic compass for companies seeking to navigate their

sustainability journey through design. Within the ECODeCK project, the Design for Sustainability (DfS) framework was established as both an analytical structure and a practical tool to explore and support the multifaceted role of design in enabling sustainability-oriented transitions within the manufacturing sector. Rather than treating sustainability as a static outcome, the framework conceives it as a dynamic process that design can initiate, shape, and steer through diverse forms of intervention across scales and systems (Gaziulusoy & Brezet, 2015). The development of the framework was grounded in a robust qualitative research design. This process integrated a systematic review of existing literature with empirical mapping and analysis of sustainability-driven design practices across Europe. A total of 90 manufacturing companies were identified, the majority of which were micro-, small-, or medium-sized enterprises (SMEs), a segment recognized for its agility and innovative potential but often underrepresented in sustainability policy frameworks. From this sample, 77 cases – comprising 44 fashion companies and 33 furniture manufacturers – were selected for in-depth analysis. These organizations demonstrated noteworthy efforts in embedding sustainable design principles within their operational, strategic, and collaborative processes. The analysis uncovered distinct, recurring patterns in how design is leveraged to advance sustainability, culminating in a tripartite framework structure. This structure reflects different dimensions and levels of design engagement, which collectively provide a nuanced understanding of how design contributes to sustainable manufacturing transitions (D'Itria, Pei & Bertola, 2024). Specifically, this framework delineates three progressively integrated modes of design engagement – technological, strategic, and systemic – that focus on specific dimensions of design action and design thinking as applied to product, organization, and system levels (D'Itria, Pei & Bertola, 2024; Ceschin & Gaziulusoy, 2019). Rather than representing discrete categories, these modes form a continuum, illustrating varying degrees of maturity and ambition in sustainability-oriented design practice (D'Itria, 2025; D'Itria, Pei & Bertola, 2024; Gaziulusoy & Erdoğan Öztekin, 2019).

Product-Centric & Insular Sustainability: At the foundational level, design efforts concentrate on optimizing the technical characteris-

tics of products and processes. This includes selecting eco-friendly materials, redesigning for disassembly or recyclability, enhancing energy efficiency, and applying lifecycle thinking. Although these initiatives tend to be localized and product-focused, they constitute a critical entry point for embedding sustainability in design practices, especially within SMEs that often face resource constraints.

Organization-Centric & Responsible Sustainability: The second level moves beyond purely technical concerns, emphasizing a broader organizational focus. Here, design serves as a catalyst for redefining business models, frequently involving a shift from product manufacturing toward service provision or circular economy approaches. Firms operating at this stage harness design to align their internal operations with ethical principles, sustainability commitments, and stakeholder expectations. This level reflects an increasing recognition that sustainability necessitates not only material modifications but also cultural and structural transformations within organizations.

Ecosystemic-Centric & Environmental Sustainability: At the most advanced level, design is envisioned as a driver of systemic transformation. Organizations engage in collaborative processes that extend beyond their boundaries, co-creating solutions with a diverse array of stakeholders – including suppliers, customers, public institutions, and civil society groups. This systemic perspective acknowledges the complexity inherent in industrial ecosystems and underscores the importance of shared responsibility, long-term visioning, and regenerative design practices. Consequently, design becomes a strategic tool for fostering partnerships, facilitating dialogue, and stimulating innovation that can influence policy and promote large-scale sustainability transitions.

The DfS framework is grounded in theories of systems thinking and transition design and is further articulated through a visual model that illustrates the interconnected nature of these three modes. Rather than prescribing a linear pathway, the framework highlights multiple entry points and trajectories, acknowledging that organizations may operate simultaneously at different levels depending on context, resources, and strategic intent (Gaziulusoy & Brezet, 2015). The framework contributes not only to a deeper understanding of how design practices evolve in response to sustainability imperatives but

also offers a structured approach for reflecting on and guiding organizational development. It captures how design can move from isolated interventions to become a cohesive force for innovation, aligning technological, organizational, and societal goals. The resulting *design-driven sustainability continuum*, as conceptualized within the ECODeCK project, enables companies to situate themselves within a wider landscape of transition and to envision strategic pathways for deeper engagement. The framework forms a core component of the ECODeCK capacity-building model. It provides the conceptual grounding for developing educational interventions that empower professionals and organizations to understand, navigate, and lead sustainability transitions. By recognizing the evolving role of design – from technical optimization to systemic co-creation – the framework equips manufacturing actors with the vocabulary, structure, and strategic orientation needed to act intentionally and effectively in the face of complex sustainability challenges.

2.3 The Sustainable Transition Comp (ST Comp)

In parallel with the development of the Design for Sustainability framework, the ECODeCK project also elaborated a second key theoretical outcome: the Sustainable Transition Comp (ST Comp). While the former focuses on the transformative potential of design, the ST Comp addresses the human dimension of sustainability transitions, highlighting the behavioural, cognitive, and value-based shifts required to enable meaningful and systemic change within the manufacturing sector. Achieving more sustainable practices in the manufacturing context demands a fundamental shift in behaviour and mindset across all people and significant changes in the knowledge, skills and attitudes that workers should acquire (Rieckmann, 2012; Wiek *et al*., 2011 as cited by Bruno *et al*., 2025). Sustainability competence shift should impact all organisational levels, enabling people to embrace innovation and to adopt a holistic and ecosystemic approach that considers the entire lifecycle of products and the awareness of their impact on society. Therefore, one of the primary aims of the

project was to understand which competencies professionals should nurture to face the ongoing transformation, identifying the specific knowledge, skills, and attitudes required to drive sustainable practices within the manufacturing sector. From here, the urgency of defining a framework of competence for sustainable upskilling to be used in the specific context of manufacturing companies.The Sustainable Transition Comp (ST Comp) is the competence framework developed within the ECODeCK project to support capacity building for sustainability, specifically in the manufacturing context. It has been built starting from the Green Comp framework, developed by the European Commission (EC), whose aim is to foster a sustainability mindset and includes the competencies to responsibly think, plan and act with care for our planet and all life forms. However, in its form, GreenComp is of limited support in informing the development of capacity-building in the context of manufacturing companies. It requires an adaptation in the specific context it is applied. Therefore, the ST Comp has been design by readapting the Green Comp to respond to the distinct needs of manufacturing organizations and make it operational. It has been readapted by using two main lens I) the organizational culture lens that allowed reframing the competencies to the context of the training model and II) the design lens that allowed reframing the overall organization of the competence framework to suit the design-driven nature of the training model and its envisioned design-based approach. Those lenses allowed integrating both the internal cultural dynamics of companies and the strategic and transformational role of design thinking and practice. Its development followed an iterative process of analysis, synthesis, and refinement, combining theoretical grounding with empirical insights gathered from industry engagement and design research (Bruno *et al*., 2025). The resulted ST comp aims to support training and skills development in the context of manufacturing companies. It includes 11 sustainability competencies divided into four main areas of competence development. It includes the crucial competencies that, taken together, promote sustainable development for people operating in the context of the manufacturing field. It aims to be the reference framework for training and empowering professionals working at different levels of the organization, from managers to employees, offering them clear and precise guidance for

acting responsibly in their daily working practices with a sustainable mindset.

The four interconnected competence areas are:

- *Values Pillars for Sustainability*: Encompasses core competencies rooted in ethics and values that support responsible decision-making and practices. It involves recognising the importance of protecting the environment, respecting the rights of all species, supporting fair practices for future generations, and challenging the status quo through the promotion of sustainable values.
- *Thinking Style for Sustainability*: Focuses on adopting a systemic and holistic approach to problem-solving. Competencies here include critical thinking, systems thinking, and the ability to creatively analyse complex challenges from a sustainability perspective.
- *Design Processes for Sustainability*: emphasises the ability to approach problems and envision solutions using design methodologies that prioritise human and planetary needs in organisational decisions and actions.
- *Agency for Sustainability*: highlights empowerment, collaboration, and leadership. It refers to the capacity of individuals and organisations to take initiative and drive positive change toward sustainability goals.

Accordingly, the 11 competencies identified are equally important and all of them should be developed and encouraged. For each competence, the framework outlines the knowledge, skills and attitudes that should be empowered to enact and apply the competence in everyday work. This framework is designed to engage professionals working at different levels of the organization, from managers to employees, offering them guidance for integrating core principles of sustainability into their daily practices, developing the ability to understand the ethical pillars of sustainability and translate them into tangible actions, as well as being capable of analyzing and addressing sustainable challenges with innovative and forward-looking perspectives. It is designed to support capacity-building model training to promote transformation and circular sustainable innovation within companies through design-based programs. Fundamental is the ability to

understand the ethical pillars of sustainability and translate them into tangible actions, as well as the ability to analyze and address sustainable challenges with innovative and forward-looking perspectives. ST Comp not only provides a shared language to frame sustainability competencies but also acts as a pedagogical guide for structuring transformative educational experiences within manufacturing organisations. Indeed, the framework has become fundamental to structure and define the specific learning outcomes of the capacity-building training pathways.

2.4 The ECODeCK Capacity-Building Model

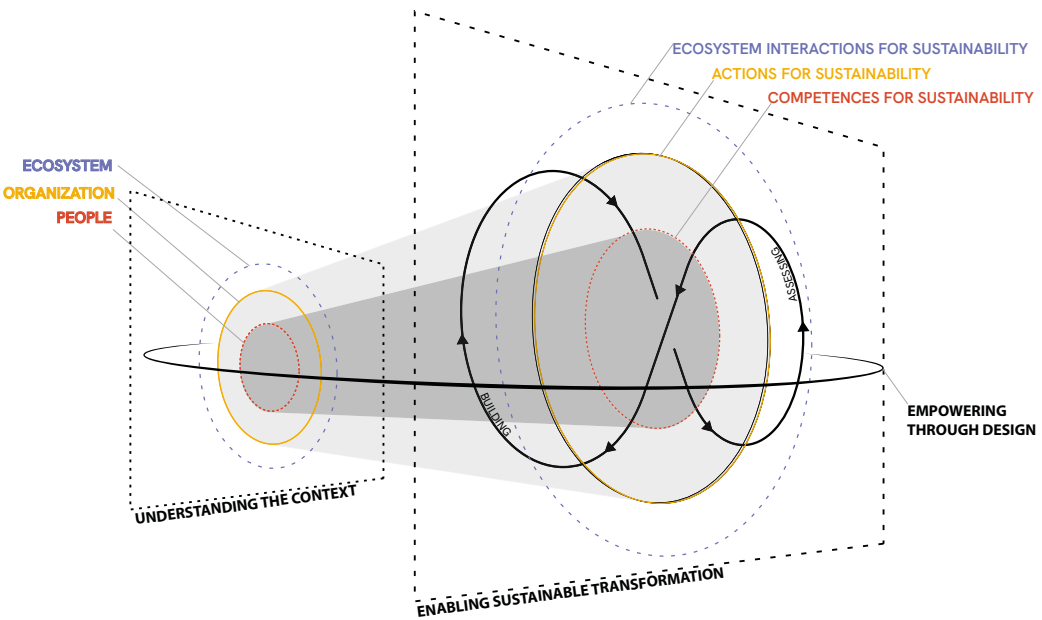

Figure 2.1. ECODeCK Capacity building model visualisation.

Completing the triad of theoretical outcomes developed within the ECODeCK project, the ECODeCK Capacity-Building Model translates the insights of the Design for Sustainability framework and the Sustainable Transition Comp into an integrated educational strategy. At the heart of the project, this model is grounded in Transformative Learning Theory (Mezirow, 2003), which emphasizes critical reflection, perspective shifts, and experiential engagement as catalysts for

deep and lasting change. Further elaborated in the following paragraphs, the model leverages design not merely as a creative practice, but as a method for empowerment and future-thinking – capable of equipping individuals and organizations to navigate the complexities of sustainability transitions and to drive systemic transformation. As such, it provides the first high-level and theoretical articulation of our educational approach, clearly defining the perspective from which our training operates: one that sees learning as a transformative, design-led process aimed at fostering critical agency and long-term cultural change within the manufacturing sector. Central to this approach is the recognition that training must operate across interconnected levels of impact. At the *individual* level, the model fosters awareness, competencies, and agency, enabling professionals to critically engage with sustainability and take informed action. At the *organizational* level, design-based learning supports strategic reorientation, encouraging companies to reframe their practices, cultures, and innovation processes around sustainability values. At the *ecosystem* level, the model promotes the development of collaborative networks, policy engagement, and territorial innovation clusters that sustain systemic transformation.

Thus, each level addresses a specific dimension of sustainable transformation, from developing individual competences to enabling organizational strategies and fostering systemic collaborations. In particular, at the *people level*, the focus is on developing *competences for sustainability* – the knowledge, skills, attitudes, and values that enable individuals to engage critically and constructively with sustainability challenges. This is operationalised through the Sustainable Transition Comp (ST Comp) framework, which emphasizes areas such as values-driven thinking, systems thinking, design processes, and agency for change. The goal is to move beyond compliance-based or purely technical training, empowering individuals to act with creativity, critical awareness, and collaborative intent in complex and evolving contexts. These competences form the essential foundation for initiating change. At the *organizational level*, these individual competences are translated into *actions for sustainability*. Here, design becomes a strategic lever to rethink and reshape business models, production systems, stakeholder engagement, and innovation strategies.

ECODeCK supports this process through the Design for Sustainability (DfS) framework, which guides companies in evolving from isolated technical improvements (insular sustainability) to more systemic and collaborative models (responsible and ecosystemic sustainability). This approach enables organizations to align operational practices with long-term sustainability objectives. Finally, at the *ecosystem level*, the focus shifts to *ecosystem interactions for sustainability*, emphasizing the role of territorial networks, policy frameworks, and cross-sectoral collaborations. In this dimension, companies connect with researchers, designers, institutions, and communities to co-create enabling environments for systemic change. ECODeCK fosters the emergence of sustainability innovation ecosystems through living labs, participatory workshops, and shared learning platforms that promote dialogue and diffusion of sustainable practices. Design, in this context, functions as a catalyst for orchestrating relationships, fostering alignment, and embedding sustainability into broader socio-economic systems. Thus, the model employs a combination of strategic design tools – such as scenario building, stakeholder mapping, and value proposition design – and participatory methodologies that engage individuals and groups in collaborative learning and decision-making. This dual approach allows companies to co-design actionable roadmaps that are both context-specific and future-oriented, aligning sustainability goals with concrete operational strategies. The inclusion of diverse actors – ranging from employees and managers to external stakeholders such as suppliers, policymakers, and local communities – ensures that the process is not only inclusive but also reflective of the complex ecosystems in which companies operate. Through structured dialogue, iterative prototyping, and collective sensemaking, the model fosters a deeper understanding of shared challenges and opportunities. It equips organizations to navigate uncertainty, adapt to evolving sustainability demands, and internalize a culture of continuous improvement. Ultimately, this process contributes to the emergence of systemic change, enabling companies to move beyond isolated innovations and toward integrated, regenerative models that create long-term value for both their sectors and the broader social and environmental context in which they are embedded. By integrating individual, organizational

and ecosystemic dimensions, the ECODeCK capacity-building model creates a multi-scalar, participatory, and action-oriented framework for embedding sustainability into the core of industrial and educational ecosystems.

2.5 The ECODeCK Training Model

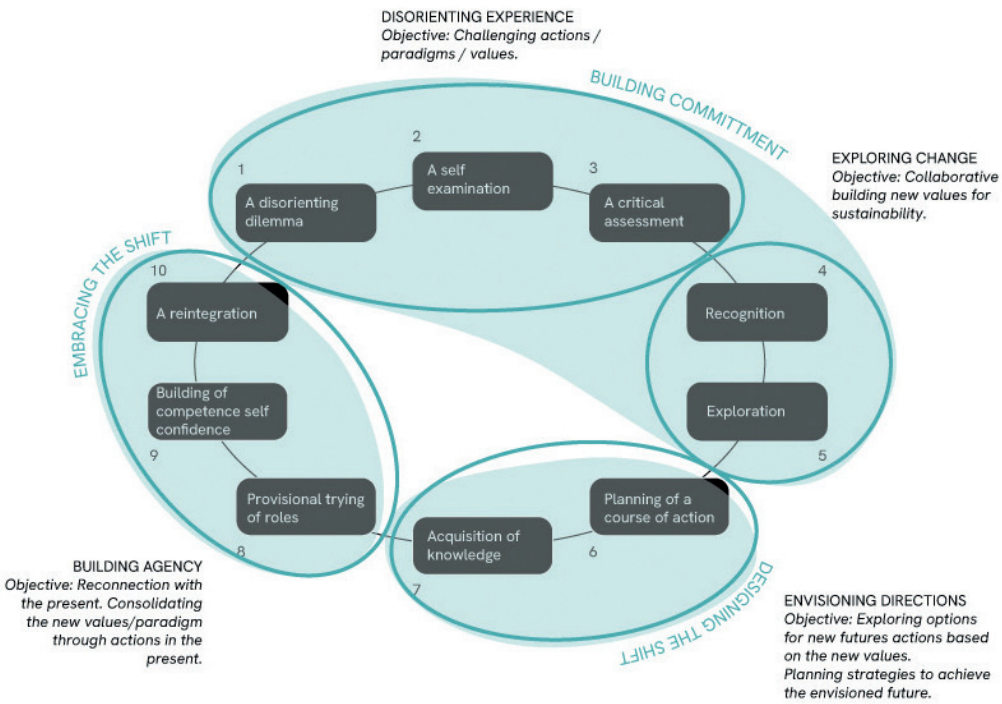

Figure 2.2. ECODeCK Training model visualization.

To fully understand the intent and direction of the ECODeCK training model, it is essential to frame it within the broader conceptual structure from which it emerges. Without this framing, the pedagogical choices and strategic orientation of the project risk appearing merely operational or disconnected from its deeper aims. The following section therefore sharpens the focus, presenting the theoretical *funnel* through which the ECODeCK educational model is shaped. At the core of this framework lies Jack Mezirow's Transformative Learning Theory (2003), which positions adult learning as a profound, iterative process driven by critical self-reflection. Mezirow outlines ten phases that of-

ten characterize this process, including self-examination, the recognition that others share similar transformations, the planning and testing of new roles, and ultimately the reintegration of a revised perspective into one's life. The outcome is not merely a change in what one knows, but a fundamental shift in *how* one knows – enabling more autonomous, reflective, and responsible action. At its core, this theory suggests that meaningful learning occurs not simply through the acquisition of new information, but through the transformation of previously held beliefs, assumptions, and frames of reference. This transformation is often initiated by a *disorienting dilemma* – an experience or realization that challenges the learner's existing worldview, prompting a period of introspection and reassessment. In the context of sustainability, such dilemmas may emerge from confronting the environmental and social impacts of one's industry or professional practices. As learners engage in critical dialogue, self-examination, and exploration of alternative perspectives, they begin to reconstruct their understanding of what is possible and necessary. This process culminates in a significant shift in mindset – one that enables individuals to adopt new values, embrace more systemic and future-oriented thinking, and take informed, purposeful action aligned with sustainability goals. This theoretical foundation is particularly relevant in the context of sustainability, where professionals are often called to question deeply ingrained assumptions and adopt new, more systemic perspectives. ECODeCK embraces this transformative potential by structuring its educational approach into three iterative and interrelated phases that guide learners through a journey of awareness, visioning, and action.

The first phase, **Building Commitment**, initiates the learning process by creating the conditions for deep self-examination and critical reflection. It begins with a *disorienting dilemma*, prompting participants to question taken-for-granted assumptions embedded in their professional practices, organizational cultures, and sectoral norms. This is followed by stages of *self-examination* and *critical assessment*, in which learners begin to confront their values and recognize the need for change. Aim of this phase is to foster recognition and exploration of alternative perspectives, to drive sustainable transition. The second phase, **Designing the Shift**, focuses on envisioning new directions based on the insights gained. Learners engage in the *ac-*

quisition of knowledge and the *planning of a course of action* – building strategic understanding of how sustainability goals can be translated into concrete organizational change. Scenario-building, storytelling, and collaborative foresight methods are used to co-design desirable futures. This phase supports the formulation of clear and context-sensitive pathways, encouraging alignment between sustainability values and future-oriented strategies.

The third phase, **Embracing the Shift**, emphasizes active experimentation and the internalization of new paradigms. Participants engage in the *provisional trying of roles*, applying what they've learned in real-world settings. This is followed by the *building of competence and self-confidence* as learners refine their approaches and begin to integrate sustainability into their everyday professional identities. The process culminates in *reintegration* – a consolidation of new roles, values, and perspectives. At this stage, emphasis is placed on dissemination, peer learning, and the activation of agency, ensuring that individual transformation contributes to broader organizational and ecosystemic change.

Within this model, design is not treated solely as disciplinary content but as a transformative pedagogy. It is used as a method of inquiry and empowerment that fosters creativity, collective intelligence, and systemic awareness. By engaging with design as a way of thinking and acting, participants develop not only technical knowledge but also the agency to initiate and sustain meaningful change. Ultimately, the ECODeCK training model aims to produce more than isolated learning outcomes – it seeks to generate actionable roadmaps, strengthened individual and collective agency, and the activation of sustainability-driven innovation ecosystems. These outcomes position participants not just as learners, but as changemakers and agents of change capable of influencing their organizations and broader industrial contexts through informed, collaborative, and design-led action.

2.6 From Frameworks to Practices: Feedback from International Experts

ECODeCK capacity-building model has been tested with experts from the two selected Made-in-Italy manufacturing industries: fashion and

furniture. This dual purpose was to both validate the model and explore suitable approaches for its practical application and implementation with companies. ECODeCK offers a transformative and generative learning path, moving beyond conventional training formats. Its focus lies in developing real capacities and shifting mindsets. Rather than simply transferring knowledge, the model encourages reflection and dialogue around value creation and redefinition at different levels, and exmphasizes the importance of learning as a true engine for sustainable growth. Though the model shows promising potential, it also encounters the real-world complexities faced by companies, particularly SMEs in these sectors. The proposed training model promotes an evolutionary transformation that takes time to develop. However, many Italian firms struggle with limited time and resources, which restricts their ability to invest in meaningful change. This is followed by a difficulty in clearly assessing the potential benefits, making it hard to justify efforts or gain internal support. Finally, there is a need for a strategic vision to overcome the barriers by aligning innovation with long-term goals, going beyond immediate returns and demonstrating the broader impact of change at the systemic level. The ECODeCK project has also been tested in international academic contexts, including three important international research universities in Europe: Delft University of Technology, ETH Zurich, and Chalmers University of Technology. During the two and a half years of development of the ECODeCK project, two researchers have visited the three universities with a total of six months to test and validate the developed frameworks and training models. Particularly, during the year 2024, the visiting research activities focused on engaging scholars and experts on design methodology and project-based learning from Delft University of Technology and ETH Zurich, in developing and validating a training and capacity-building model to enhance manufacturing companies' sustainability and circularity competencies. Afterwards, in the year 2025, the visiting research activities further developed the project by collaborating with scholars and experts on strategic design, design for sustainable innovation, and design for sustainable products from Delft University of Technology and Chalmers University of Technology, to refine and test the training model and design methods that support manufacturing companies in developing and implementing

sustainable solutions through co-creating with stakeholders across the supply chain. The ECODeCK project has also been tested within leading international academic environments, specifically through collaborations with three important European research universities: Delft University of Technology, ETH Zurich, and Chalmers University of Technology. Over a period of two and a half years, two researchers conducted a series of visiting research activities of six months in total, aimed at testing and validating the design for sustainability frameworks and the design-based capacity-building model. In 2024, the research visits focused on engaging scholars and experts in design methodology and project-based learning at Delft University of Technology and ETH Zurich. These collaborations supported the development and preliminary validation of a training model intended to strengthen sustainability and circularity competencies in manufacturing companies. Building on this foundation, the 2025 phase of the project expanded its scope through collaboration with researchers specializing in strategic design, sustainable product development, and innovation for sustainability at both Delft University of Technology and Chalmers University of Technology. These engagements contributed to refining and validating the design-based training model and design methods, with a particular emphasis on co-creation practices that support manufacturing firms in designing and implementing sustainable solutions across the entire supply chain. In this landscape of converging urgencies and opportunities, ECODeCK emerges not only as a response to external pressures but as the expression of a research-driven vision for transformative design. At the heart of the project lies a shared commitment among its researchers to reframe sustainability as a systemic and cultural process – one that goes beyond technical compliance to actively reshape practices, mindsets, and relationships within and across industries. The following sections present the conceptual foundations and methodological approaches developed by the ECODeCK research team, highlighting how their interdisciplinary perspectives and design-led inquiry aim to catalyze sustainable transitions within the fashion and furniture sectors and, more broadly, within the *Made in Italy* paradigm.

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PART 2

Seven Design Perspectives

3. Designing Learning for Sustainable Transition

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3.1 Introduction: Academia and the *Real World*

Oftentimes, it happens to hear students and colleagues speak earnestly about "bridging *academia* and the *real world*" – as if the universities were some floating islands, disconnected from reality. This perspective could become comfortable as it allows academic institutions and researchers to distance themselves from the responsibility of driving the cultural shifts required for a sustainable transition. However, academia is not outside the system – it is part of it. It shapes and is shaped by the very ecosystems it claims to analyse. Recognising this embeddedness means acknowledging that academics are active agents of transformation. We, people working in academia, need to feel responsible and understand how our astounding profession can be translated into concrete actions to support this change. The perceived separation between academia and the so-called *real world* is the provoking starting point of the present argument, the

underpinning assumption the chapter seeks to question, and the idea that the ECODeCk project aims to challenge. Indeed, the chapter aims to argue that one of the most powerful ways people working in academia can contribute to this transformation is by adapting their core mission, supporting learning and competence development, to a broader and increasingly plural audience.

The chapter frames ECODeCK from the lens of learning and education, using it as a reflection and result of one of the academics' most valuable assets: designing instruction and supporting learning. This perspective on the project will hopefully provide academics with a rationale for envisioning their roles in promoting the desirable change within and outside academia. To make this role effective, however, we need to conceive of our educational role beyond teaching duties and imagine how we might design instruction to build capacity for contexts other than academic curricula and courses, while employing the know-how and expertise developed there. Fostering the competencies needed to respond to contemporary, complex challenges is not peripheral; it is a direct and pragmatic way to support systemic change and a cultural shift toward more environmentally sustainable and socially just paradigms.

3.2 The Project's Rationale: Design Academics' Responsibility in Promoting Education for Sustainable Development

This section seeks to justify why academics, particularly those in design research, should direct their efforts toward developing design-based education for sustainable development, extending its impact beyond the confines of the classroom. Instead, the three core assumptions presented here will provide a foundation for understanding why all academics, across disciplines, are responsible for contributing to sustainable development education (first assumption). Specifically, design, as both a field of knowledge and research, can play a pivotal role in two critical areas: innovating instructional

practices (second assumption) and fostering sustainability competencies through design-based, hands-on learning (third assumption). This is not a claim of design pedagogy's superiority, nor an assertion that design academics are more prepared, qualified or entitled to lead initiatives in education for sustainable development. The purpose here is to incentivise design academics and educators to engage more critically with their educational projects, and apply them to new contexts beyond the classroom, and apply a designerly mindset to improve their practices iteratively.

3.2.1 First Assumption: Academia Should Nurture People's Competences Beyond the Classroom

Acknowledging the roles of academia within the ecosystem is a crucial step in envisioning its potential role(s) and addressing the significant challenges that need to be tackled to ensure a regenerative future. Among others, one key objective is to ensure sustainable consumption and production patterns, specifically the UN's 12th Sustainable Development Goal. This transformation needs, first and foremost, a paradigm change that informs the conception of production and consumption. Thus, new paradigms must emerge, consolidate, and become the foundation for policy, economies, operations, and practices. Innovation and knowledge-creation models that consider the systemic nature of these processes are allies to understanding *why* we need this change and inform *how* it can be done (Carayannis *et al*., 2012). The interest in considering these models here is to understand the role of academia within this systemic interaction.

The Quintuple Helix innovation model and Mode 3 knowledge are adopted, as they effectively conceptualise the systemic interaction between innovation and knowledge production for social-ecology transition. Carayannis & Campbell (2010) introduced the Quintuple Helix innovation model that works by viewing sustainable development as a result of dynamic interactions among five key societal spheres or 'helices': the education system, economic system, political system, media-based and culture-based public, and the natural environment. The model emphasises the circulation of knowledge and know-how among these helices, with the natural environment recognised as a crucial driver for innovation geared towards socio-eco-

logical transition. Mode 3 knowledge supports this by promoting the coexistence and integration of diverse knowledge production modes and encouraging interdisciplinary and transdisciplinary application. Together, these models provide frameworks that highlight the importance of systemic collaboration and integrated knowledge in addressing environmental challenges and fostering sustainable development. Thus, the *Quintuple Helix* innovation model can effectively help remind us of the key role of academia in shaping innovation through sustainable knowledge production that contributes to sustainable development. More broadly, this sustainable knowledge fosters the circulation of knowledge through education and the capacity building of individuals (i.e., human capital). Indeed, education produces competent people, which in turn becomes an input to the economic system.

Carayannis *et al*. (2012) effectively represent that the education system is particularly stimulated to produce sustainable knowledge and to build learners' competences toward sustainable transition if it receives high investments from the political system as an input. This model provides an effective key to understanding how the ECODeCK project's underlying idea reflects the systemic role of academia, as it fits coherently into the Quintuple Helix, as depicted in Figure 3.1. The supranational political system (i.e. the European Union) decided to finance national political systems through the Next Generation EU programme. The Italian national system has cascaded funding to the educational and economic systems (i.e., Piano Nazionale di Ripresa e Resilienza) precisely to foster sustainable development at the national level. More specifically, through this funding, the extended partnership between universities and companies was created, Made in Italy Circolare e Sostenibile (MICS), to support the creation and circulation of knowledge in order to promote the socio-ecological transition of Italian manufacturing within key sectors (e.g., fashion, furniture and automation). Within MICS, the project ECODeCK was conceived to develop a capacity-building model for cross-departmental employee groups operating within companies that manufacture goods. Thus, investment in the education system at the supranational and national levels nurtures, through ECODeCK, the development of know-how about effective pedagogies to support the paradigmatic shift within diverse national manufacturing contexts. The idea is that

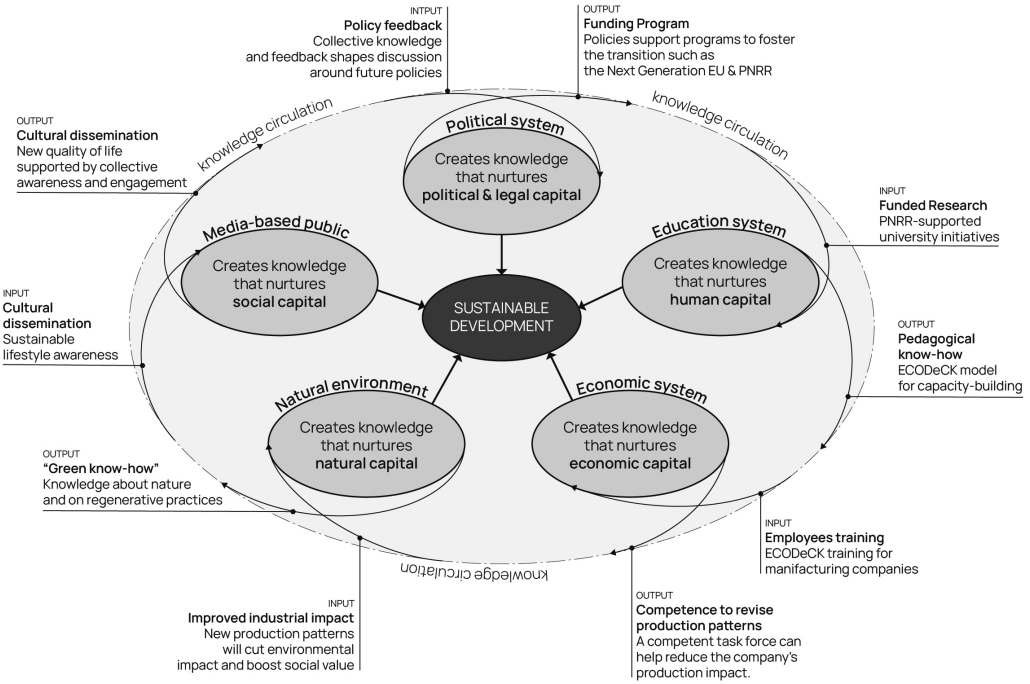

Figure 3.1.
Quintuple Helix model adapted from Carayannis *et al*. (2012) to present ECODeCK rationale.

participation in the capacity-building model allows the construction of the competencies needed for the socio-ecological transformation of the human capital of the industrial context involved, contributing to the transformation of production patterns through the review of the manufacturing system (e.g., products, business model, supply chain ecosystem). These new patterns aim to nurture natural capital by reducing the impact of production, for instance, on the local natural environment and social fabric, actively contributing to the environmental regeneration process. In turn, the produced *green know-how*, as named by Carayannis *et al.* (2012), provides new knowledge about nature and fosters the spread of more sustainable and regenerative lifestyles. Media and cultural actors play a crucial role in translating this knowledge into social capital, raising awareness and promoting accessible ways of living sustainably across society. This contributes to the construction of a new quality of life, nurturing the social capital that then flows back into the political system as collective knowledge, shaping discussions that generate new political and legal capital. The outcome is a set of sustainable policies and investments that reinforce the effectiveness of the Quintuple Helix and circulate back into

education, economy, natural environment, and culture, closing the loop of systemic transformation. Thus, the ECODeCK project is rooted in the recognition of academia and the academic profession as a key system contributing to knowledge circulation through education and training, way beyond the classroom.

3.2.2 Second Assumption: Design Academics Should Promote Instructional Design Innovation

The second assumption is rooted in a key understanding, already discussed in previous publications (Mattioli, 2022; Mattioli, Cipriani, *et al*., 2023) that design academics are uniquely positioned to promote innovation of instructional design in situated contexts. This assumption stems from a convergence of insights across educational and design research, highlighting the potential of design culture to enrich and transform teaching practices. As defined in international literature, instructional design refers to developing educational models and strategies that ensure learning is effective, compelling, and stimulating (Bonaiuti, 2019). This field has long acknowledged the need for approaches grounded in actual design practices rather than abstract pedagogical ideals (Tracey & Boling, 2014). Yet, a persistent gap remains in how instructional designers are trained, particularly in understanding real-world design work and in developing effective methods for teaching design as a complex, situated (Tracey & Hutchinson, 2016). In this context, design academics are uniquely positioned to respond to these challenges by integrating their expertise into instructional innovation. They possess the disciplinary grounding and the practical orientation needed to treat teaching itself as a design practice. This perspective aligns with a growing pedagogical shift that frames educators as learning designers (Biggs & Tang, 2007; Kalantzis & Cope, 2010; Sancassani *et al*., 2019), acknowledging that teaching involves crafting learning experiences with intentional structure and creativity. Just as in industrial design, instructional design involves the iterative creation of artefacts – courses, curricula, activities – that respond to ill-defined educational problems through a thoughtful process and evaluation. The parallel suggests that design educators can play a transformative role by consciously applying their design knowledge, such as iterative prototyping, human-centred

analysis, and creative problem framing, to reimagine teaching strategies, environments, and assessment methods. Doing so helps bridge the gap between design theory and educational practice, advancing both fields. Therefore, this research assumes that design academics should adopt instructional design principles and actively drive innovation, using their disciplinary culture to respond to contemporary education's complexities and opportunities.

3.2.3 Third Assumption: Education for Sustainable Development is Coherent with Design

Education for Sustainable Development (ESD) can be defined as a vision of lifelong learning education that seeks to balance human and economic well-being with cultural traditions and respect for the Earth's natural resources. ESD should be framed across disciplines and applied to all types of learning, i.e., implicit, informal, and formal. Hence, ESD learners can be students in formal education or vocational education, as well as trainees in corporate training programs, participants in non-formal learning contexts such as adults attending a community workshop on sustainability organised by a local NGO (UNESCO, 2020). Coherently, ESD educators can be teachers, trainers, community leaders, and family members involved in the learning process (ibid.).

Despite variations, ESD is generally understood as an integrative approach that cannot ignore the interconnections between sustainable development's environmental, social, economic, and cultural aspects (UNESCO, 2007, 2020; Venkataraman, 2009). According to UNESCO (2020) ESD is the means that allows for I) raising awareness of the 17 SDGs in education settings; II) promoting their critical and contextualised understanding of the SDGs; and III) mobilising action towards their achievement. The meaning, priorities, and strategies for ESD can vary based on local realities, history, and political and cultural traditions, affecting whether approaches lean more towards a pedagogical orientation, emphasising learning and participation, or a more instrumental one, emphasising changing behaviour.

The characterisation of the term through the words 'sustainable development' further emphasises this connection with SDG and semantically differentiates it from environmental education ¾ although

there are differing views on the two types of education to the point where some say they are the same thing, while others say they are two separate things (Wals & Kieft, 2010). Despite the open debate around the terms 'sustainable development' and 'environmental', there is increasing attention paid to the pedagogical dimension of ESD, the 'E' of 'education', with a shift from instruction and training towards learning and capacity building for sustainable development (ibid). This enables people to contribute in a meaningful and contextually relevant way to foster sustainable development. It emphasises aspects of learning across disciplines that enhance the transition towards sustainability, such as future education, citizenship education, education for a culture of peace, gender equality, human rights, health education, population education, education for protecting and managing natural resources, and education for sustainable consumption.

A key outcome of ESD is the concept of 'sustainability competence', referring to the qualities people need to possess to act effectively when confronted with a sustainability challenge. In general terms, competences can be described as the capacity to mobilise relevant knowledge (e.g., figures, concepts, ideas, theories), skills (e.g., facilities, procedures, know-how) and attitudes (e.g., dispositions, mindset) to respond appropriately and effectively to the demands of a given context (European Parliament and European Council, 2006; OECD, 2005). Coherently with a constructivist view on learning, education has been increasingly grounded in a competency-based model (Castoldi, 2021). Accordingly, sustainability competences are multifaceted and encompass the relevant knowledge and the ability to think, act, and take responsibility from a holistic perspective. It encompasses working interdisciplinarily, participatory competence, and thinking forward-looking, embedded in a *planetary consciousness* paradigm (Wals & Kieft, 2010). Given the growing emphasis on education for sustainable development, scholars, international bodies, and institutions are increasingly identifying the competencies needed to foster sustainability.

As a result, several sustainability competence frameworks have been recently developed, though a lack of terminological and conceptual clarity around the concept of competence, often used interchangeably with skills, abilities, and capabilities (Baartman *et al*.,

2007; Cebrián & Junyent, 2015; Bianchi, 2022). Despite varied terminologies, these frameworks allow for a shared understanding of what individuals need to be competent for sustainable development.

Finding a framework of design competences or design research competence is more difficult. On the one hand, it is challenging to define design competences (and the profession of designers) given the intrinsic nature of design, which is a relatively young area of knowledge that exists between the science-art paradigm and has evolved throughout its history in response to socio-technical and economic transformations (Rampino, 2022). On the other hand, it is even more challenging to define the design researchers' competences since academic design research often exists at the boundary of other disciplinary areas (Mattioli, Figoli, *et al*., 2023; Stappers & van Boeijen, 2022), often developing knowledge within a pragmatic paradigm and through practice-based approaches that are difficult to position clearly in more structured research paradigms typical of the hard sciences or social sciences. As an example of this, the European Skills, Competences, Qualifications and Occupations framework (ESCO), a multilingual competences classification system across the EU, does not include the role of the design researcher and limits the description of the profession of designers (e.g., industrial, fashion, graphic etc.) to traditional technical skills (Directorate-General for Employment, 2024), reflecting a prevalent understanding of design profession under a technical perspective (Rampino, 2022) and overlooking the cognitive and metacognitive competences widely acknowledged in academic design literature.

Scholars, especially in strategic design as already discussed in chapters (see Chapter 4 and Chapter 7), have extensively discussed the role of design knowledge integration. In the early 2000s', Bertola & Teixeira (2003) identified design as a knowledge agent fostering innovation, claiming it acts as a knowledge integrator in global settings and a knowledge broker in local contexts, collecting, analysing, and synthesising knowledge. Their research showed the ability of design to adapt its approach to different contexts. Manzini (2015) argued that design holds the capacity for social change as designers engage in problem-solving and sense-making. They are critical, creative, and dialogic, using storytelling, visualisation, and relational expertise to

foster collaboration and make things happen, adopting a human-centred approach.

More recently, Melazzini (2021) investigated how design competences (called capabilities), when embedded in human resources practices, can foster individual creative confidence and engagement, contributing to organisational cultural change and how design activates motivation, mindsets, and behaviours that, in turn, influence broader company culture. In parallel, Dastoli (2022) explores how design capabilities support the co-creation of entrepreneurial ecosystems in manufacturing. Her research showed how design enables firms to integrate diverse knowledge sources, navigate technological complexity, and foster cross-organisational collaboration for new product development. The following authors are cited, among others, not to provide an exhaustive review of the literature – an endeavour beyond the scope of this chapter – but to exemplify how design competence has been described, particularly in terms of cognitive abilities that extend beyond traditional technical skills.

Thanks to a structured conversation held at the DRS2024 conference (Pei *et al*., 2024), which confirmed our assumption further. After a short introduction, we invited participants to share their experiences regarding design-based capacity building for sustainability. The main design competences that participants pointed out as coherent with sustainability competencies encompassed:

- **problem framing and solving**, as design provides an orientation toward wicked problems and disciplinary proficiency to handle uncertain and complex situations related to sustainability issues;
- **adaptive capacity**, as the iterative nature of design involves testing, experimentation, feedback, and refinement, which aligns with the uncertain nature of sustainability outcomes;
- **cross-disciplinary and cross-cultural collaboration**, as the design requires interdisciplinary and transdisciplinary collaboration as well as collaboration among diverse stakeholders by using engaging storytelling and making complex matters more accessible;
- **visioning and future orientation**, as design focuses on potential opportunities through creativity and proposes defining

new values to break away from traditional patterns, which is key for sustainable transition.

According to this, we assume that design (as a field of knowledge) and design competencies have much to offer to ESD, as they are profoundly aligned with sustainability competencies, as is here discussed more thoroughly latter chapter (see Chapter 5, Chapter 6).

3.3 Designing a Project to Support Learning About Sustainable Development

The previous section allowed to clarify the *whys* that justify the need for academics, especially those operating within design research, to dedicate their efforts to the development of design-based education for sustainable development, beyond the classroom. This section aims to articulate *how* we, a group of design researchers and educators, constructed an instructional project to foster ESD in an organisational setting of the manufacturing sector through design. In other words, the section allows re-reading ECODeCK and its components through the lens of instructional design.

3.3.1 Laying the Project's Foundations: Learning as Socio-Constructive, Transformative and Participatory

Before presenting the ECODeCK's project components, a clarification on the perspective of its theoretical foundation is needed. Jickling & Wals (2008) use a two-axis heuristic to position ideas about education for sustainable development curricula and the social role of the educated person. One axis contrasts conceptions of education from transmissive to socio-constructivist and transformative. The other axis ranges from an authoritative and compliant educated citizen to a participatory and active one. This framework helps analyse the dynamic relationship between educational approaches and the desired role of the learner in society, especially to determine learners' agency and, thus, coherently design their involvement in participatory activities.

A key question to be raised is: how aware or conscious are those supporting, designing, implementing, monitoring and evaluating

> **these projects and activities of the nature of participation that is offered or allowed? Such awareness and reflection on the underlying assumptions and their resulting implications for the role of citizens in these projects, is critical if only to avoid that people are unwittingly being used to advance an agenda entirely set by outside authorities or are given the illusion of full participation whereas in reality their space for self-determination and autonomy is limited by a glass ceiling (Wals & Kieft, 2010, p. 18).**

Hence, this heuristic can also be an analytical and critical tool for ECODeCK. It helps position our educational ideas and reflect on how our instructional designs shape the intended learning outcomes and the role of the learner. This two-axis framework is employed here to discuss the theoretical foundation of the project, in the belief that making ECODeCK's positioning clear is a key passage to understanding the learning experience it envisions as coherent and compelling.

Within ECODeCK the idea of learning is grounded in a constructivist epistemology and an interpretive paradigm. This perspective posits that learning is an individual construction profoundly influenced by contextual, experiential, individual, and social factors (Bada, 2015; Clements, 2011; Vrasidas, 2000). From a constructivist viewpoint, learning occurs whenever individuals encounter a new situation that compels them to reconstruct novel knowledge (Cobb, 1994). While this happens daily through life experiences, formal learning occurs in educational settings where instruction is intentionally designed. The constructivist view on learning has become common ground in contemporary education, influencing the way educators design instruction (Clements, 1997). Despite different conceptualisations of the constructivist view on learning, the essence across constructivist perspectives is that learners construct knowledge and skills through direct experience and mindful interactions with others and the environment.

Therefore, a constructive understanding of learning identifies a broader paradigm where individual, social and contextual elements play a crucial role. Among others, the CSSC paradigm proposed by De Corte (2010) provides the four key features of this contemporary learning paradigm: learning is constructive (C), self-regulated (S), sit-

uated (S), and collaborative (C). As already mentioned, constructive means that learners actively construct knowledge and skills through experience and interaction. Knowledge is not something the instructor *transfers* or *transmits* as for objectivist views on learning. Instead, knowledge is built individually by each learner and socially among learners, cumulatively drawing on prior understanding. Self-regulation means that learners manage their learning process, iteratively acquiring skills and knowledge, developing metacognitive abilities and engaging in execution and reflection. Situated means that learning occurs within a specific context, affecting and influencing learning. Lastly, since constructive learning involves social interaction, learning must be understood as a collaborative process rather than a solo effort. The CSSC paradigm helps conceptualise further how learning occurs from a constructivist perspective. Moreover, the choice of adopting transformative learning as the overarching pedagogical approach (Mezirow, 2003) further emphasises the socio-constructivist foundation of ECODeCK. Transformative learning extends the constructivist view by explicitly focusing on critical reflection and perspective transformation as essential processes through which learners make meaning. Learning becomes not only a process of constructing knowledge, but also one of questioning assumptions and shifting worldviews – a process deeply embedded in social interaction and dialogic engagement. Both socio-constructivism and transformative learning thus imply collaboration and emphasise the relevance of the social dimension of learning. They reject the notion of the learner as a passive recipient and instead position the learner as an active agent engaged in co-constructing knowledge through meaningful participation and shared experiences. This inherently aligns with the idea of education as a participatory and emancipatory practice, as represented by the right side of the heuristics by Jickling & Wals (2008). Hence, given this socio-constructivist and transformative paradigm, from our perspective, the participatory and social dimension follows as a paradigmatic condition for ECODeCK to be conceived. The project's learning activities are designed to foster co-agency and critical engagement, allowing learners to explore and challenge their assumptions in authentic, collaborative settings. In this light, ECODeCK is clearly positioned in quadrant IV of the framework proposed

by Jickling & Wals (2008), where education is both transformative in its pedagogical intent and participatory in its societal engagement. This positioning is a theoretical stance and a deliberate design choice that shapes every aspect of the project's implementation.

3.3.2 Designing a Solution: ECODeCK as an Instructional Project and Its Components

Now, it is finally possible to read the ECODeCK project through the lens of an instructional design. Much like industrial design, instructional design involves addressing ill-defined problems through creating purposeful artefacts – here, aimed at guiding learning toward defined goals (Mattioli, 2022). Following this parallel, two core aspects are relevant: the artefact produced (i.e., the instructional project) and its creation process. Each project can be examined through Kerr's framework (Castoldi, 2021; Kerr, 1968), which outlines the project and divides it into four components: I) *objectives* that are the strategic learning goals (in this case, as already mentioned, sustainability competence); II) *processes*, referring to the pedagogical and operational strategies used; III) *contents* that are the disciplinary and experiential knowledge to be conveyed; and IV) *evaluation*, the assessment of both student learning and instructional effectiveness. Concerning ECODeCK, the design of the instructional project encompassed the framing of all four components.

I) Objectives

The learning *objectives* (I) to guide ECODeCK have been refined thanks to the construction of the Sustainable Transition Comp (ST Comp), which acts as the core competence framework for the ECODeCK project, explicitly designed to support manufacturing companies in their sustainable transformation through employee capacity building. This framework is built upon the European Green Comp (Bianchi *et al*., 2022), the sustainability competence framework for lifelong learning developed by the European Joint Research Center (JRC). The adaptation process for ST Comp involved three steps – analysis, synthesis, and refinement – guided by the key lenses of organisational culture and design (Bruno *et al*., 2025). This rigorous approach ensured the ST Comp was tailored to the manu-

facturing sector's specific context, challenges, and training needs, differentiating it from the more general Green Comp. The design lens, in particular, aligned the framework with ECODeCK's design-based training approach, fostering competencies needed for innovative problem-solving and enacting change within organisations. By defining these context-specific competencies across four areas, ST Comp provides strategic learning goals for employees to embed sustainability and drive transition in their daily work.

II) Processes

In order to meet the strategic goals identified through the ST Comp and to leverage design competences within the ECODeCK instructional project, we identified as *processes* (II) three key pedagogical and operational strategies to be employed: design-based, collaborative and future-oriented processes. Design-based learning is a key pedagogical approach widely employed in design education, and it involves learners constructing knowledge, skills, and abilities by self-directing the process of creating solutions to real, open-ended problems in a situated context (Mattioli, 2022). This approach is effective for fostering holistic competence development and, if framed within a planetary-conscious paradigm, can also build the capacity to take responsible action for a sustainable transition. The focus on tackling real, often ill-defined problems in a situated context makes design-based learning well-suited to develop sustainability competences, including engagement with global issues like environmental sustainability through projects.

Moreover, the collaborative learning approach employed allows for enriching the design-based approach by underlying the relevance of collective processes in defining solutions to sustainability problems. Thus, collaboration among employees from different departments or areas within the same company allows a broader understanding of organisational practices as well as opportunities and constraints for action. Adopting a collaborative overarching approach, ECODeCK aims to support the creation of a cross-departmental group that could act as a collaborative task force, promoting sustainable transition within the organisation.

Finally, the implementation of future-oriented processes introduces a strategic foresight dimension to the ECODeCK instructional

project. These processes are designed to support participants in envisioning desirable futures and identifying the actions and innovations needed in the present to move toward them. Rooted in the field of futures studies, this approach not only encourages anticipatory thinking and long-term planning but also allows for critical reflection on the past. By exploring how different choices or trajectories could have led to alternative presents, participants can question established assumptions and expand their capacity to imagine transformative pathways forward (Ianniello, 2023). In the context of ECODeCK, future-oriented processes are operationalised through scenario-building and speculative design activities that foreground ecological, social, and organisational implications. This reflective and imaginative stance empowers participants to not only respond to immediate challenges but also to reframe their understanding of change, enabling more conscious and responsible engagement in sustainability-oriented innovation.

III) Contents

The content (III) of the ECODeCK instructional project acts as the connective tissue that integrates objectives and processes into a coherent learning experience. Rather than delivering predefined disciplinary knowledge, ECODeCK relies on immersive and participatory activities where a cross-departmental group of employees is engaged in a reflective exploration of their own organisational practices. Through this process, participants surface and critically analyse existing routines, uncovering unsustainable patterns embedded in the company's current strategies and operations. This analysis of the present is paired with a historical reconstruction of past practices, creating a diachronic understanding of the company's trajectory. Simultaneously, participants are prompted to envision alternative futures within a regenerative and sustainable paradigm, leveraging speculative and scenario-based design activities. The training model provides prompts, scaffolding, and facilitation structures to support this co-construction of knowledge, but the participants' lived experience and situated knowledge constitute the core contents. In this way, ECODeCK transforms organisational knowledge into both subject and object of learning – foregrounding it as the foundation

for reimagining future practices. As such, content in ECODeCK is not something to be transmitted but something to be activated, analysed, and redesigned through situated and collaborative engagement.

IV) Evaluation

ECODeCK frames evaluation (IV) as an ongoing process of assessment-as-learning (Yan & Boud, 2022), where assessment is not only a means to measure learning outcomes but a powerful tool to generate learning itself. Within this paradigm, evaluative activities are designed to foster the capacity for critical self-assessment among participants – encouraging them to interrogate their own practices and those of their organisation through the lens of sustainable development. Assessment becomes an opportunity for deep reflection, empowering learners to internalise sustainability criteria and use them as a framework for future decision-making. This approach aligns with the adoption of transformative learning, which emphasises the process through which individuals critically examine and potentially revise their assumptions, beliefs, and worldviews – a process that is inherently reflective and dialogical. Both transformative learning and socio-constructivism underpin ECODeCK's emphasis on collaboration, co-construction of meaning, and the centrality of the social dimension of learning. Therefore, evaluation in ECODeCK cannot be separated from its participatory foundation: it is embedded in peer discussions, collaborative critiques, and iterative scenario testing.

3.4 Conclusion: Beyond an Instructional Project, a Model by Design

This chapter began by challenging the notion of academia as a separate entity from the *real world*, arguing instead for its embeddedness within the socio-ecological system and the responsibility of academics to act as agents of transformation. We posited that a powerful means for academics to contribute to this transformation is by adapting their core educational mission to support learning and competence development for broader audiences. Specifically, we argued that design academics are uniquely positioned to drive

innovation in instructional design for Education for Sustainable Development (ESD), given the inherent coherence between design competencies and the competencies required for sustainable development. We presented ECODeCK not merely as a completed project but as a reflection of this argument, demonstrating how design expertise can be applied to instructional design to foster sustainability competencies in contexts beyond traditional academic settings. The project's rationale is rooted in the understanding that academia must nurture competencies beyond the classroom, aligning with systemic innovation models such as the Quintuple Helix, which highlights the education system's crucial role in driving sustainable development through knowledge production and circulation. The design of ECODeCK was then detailed through Kerr's framework, outlining its specific objectives grounded in the Sustainable Transition Comp (ST Comp) framework, its processes centered on design-based, collaborative, and future-oriented approaches, its situated and reflective contents, and its evaluation as an ongoing, participatory assessment-as-learning process. Underlying these components is a foundation in socio-constructivist, transformative, and participatory learning theories, positioning ECODeCK as deliberately transformative in intent and participatory in engagement. Viewed through this lens, ECODeCK emerges as more than a single instructional project; it is designed as a flexible model for capacity building to foster sustainable transition. The intentional structuring of its components – objectives, processes, contents, and evaluation – guided by a robust theoretical learning framework, provides a blueprint that can be adapted and applied across diverse contexts. The model demonstrates adaptability to multiple sectors. While the initial application and the ST Comp framework were specifically tailored for the manufacturing sector, the underlying principles of design-based problem-solving, situated learning, and competence development for sustainable transition are not limited to this area. The process of adapting the ST Comp involved analysing and refining competencies for a specific context, a methodology that can be replicated for other sectors. Similarly, the focus on participant-generated content, derived from exploring their own practices, ensures relevance across various industries – an example of relevance in the fashion design

industry can be seen in Chapter 8. Furthermore, the ECODeCK model can be adapted to address multiple needs within sustainable development. The ST Comp defines a broad set of competencies across four areas, but the model's flexible nature allows for a focus on specific subsets of competencies or particular sustainability challenges depending on the organisation's needs. The design-based, collaborative, and future-oriented processes, coupled with the situated content approach, enable tailoring the learning experience to the most pressing issues faced by the participants, whether related to production efficiency, supply chain sustainability, social equity, or other aspects of the transition. The model is also relevant across multiple entrepreneurial ecosystems. As discussed through the lens of the Quintuple Helix model, sustainable development is driven by interactions between various societal spheres, including the economic and education systems. ECODeCK's genesis within an extended partnership between universities and companies, supported by political funding, exemplifies this interaction. The model provides a structured approach for fostering competence circulation within the economic system, which is a key mechanism for driving change regardless of the specific national or regional entrepreneurial ecosystem. The core pedagogical approach is universally applicable, although the specific manifestation of political will and economic engagement may vary. Finally, while ECODeCK was implemented in a for-profit manufacturing context, its principles extend beyond profit organisations. ESD is defined as lifelong learning applicable across all types of learning and audiences, including participants in non-formal settings and community workshops. The shift in ESD towards learning and capacity building rather than just instruction and training, and the emphasis on participatory and emancipatory practices, make the ECODeCK model's foundation highly relevant also for non-profit organisations, public institutions, and community groups engaged in sustainable development efforts. The focus on developing sustainability competence, defined as the capacity to mobilise knowledge, skills, and attitudes to act effectively in sustainability challenges, is universally valuable. Adapting the 'contents' to the specific practices and challenges of a non-profit or public context, and potentially adjusting the 'objectives' framework while retaining the core partic-

ipatory and transformative processes, would allow for applying this model to drive sustainable transition in a wider array of organisational and societal settings.

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4. Designing Collaborative Strategies for Sustainable Transition

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4.1 Introduction

The growing urgency of climate change and resource reduction has placed sustainability and circularity at the forefront of strategic concerns for industries and organisations. In particular, the manufacturing sector is increasingly called upon to play a proactive role in supporting sustainable development. However, the complexity of sustainability transitions challenges conventional organisational structures, innovation models, and specific sectoral circumstances. In this context, strategic design emerges as a valuable approach for navigating this transformation, offering tools and mindsets that go beyond traditional business innovation and enabling organisations to engage with broader systemic change (Baldassarre *et al*., 2019; N. Bocken *et al*., 2023).

This paper argues that sustainable transition could be seen as an opportunity to reframe the strategic role of design within and beyond organisational boundaries for activating a collaborative ecosystem. First, it explores how strategic design can support sustainable

transition by shifting the focus from company-centric innovation to ecosystem-based value creation. It highlights how sustainability challenges offer an opportunity to extend strategic design's scope, from enhancing business performance to fostering transformative change at the systemic level. Second, the paper introduces the concept of design-based capacity building as a learning process that supports organisations and their ecosystems in developing the capabilities required for sustainable transition. Finally, the paper presents the ECODeCK project as a case study to illustrate the application of the research. The project exemplifies how a design-driven approach can facilitate capacity building at the three levels, individual, organisational, and systemic, through supporting collaboration and co-creation of sustainable solutions.

4.2 Strategic Design for Sustainable Transition: From a Company-Centric Model to an Ecosystem Perspective

The strategic value of design and design thinking for business and organisations has been acknowledged for its contributions to the new product development process (Calabretta & Gemser, 2015), business innovation (Brown, 2008; Martin, 2009; Verganti, 2009), and organisational culture (Deserti & Rizzo, 2014; Elsbach & Stigliani, 2018). Strategic design and design thinking have supported business organisations in gaining a competitive advantage by balancing the desirability, feasibility, and viability criteria in their innovation processes and outcomes (Martin, 2009). However, Baldassarre *et al*. (2024) argued that the current research on design thinking has developed mainly into how to achieve innovation faster and more effectively in competitive markets. Only 40% of the literature on design thinking focuses on the social impact that is related to improving people's lives and achieving social innovation, and only 7% of that focuses on environmental impact and sustainable development, which can be addressed by the design (thinking) principles to generate potential solutions (ibid.).

4.2.1 Sustainable Transition as an Opportunity to Explore Strategic Design Beyond Business Innovation

The growing urgency of environmental and social challenges has led companies to integrate sustainability considerations into their strategic decision-making processes. This shift is fostering the development of novel products, services, and business models that align environmental responsibility with economic growth objectives. For instance, many firms are embracing circular economy principles, designing products for reuse, remanufacturing, and recycling (Bocken *et al*., 2016). One prominent approach to addressing sustainable development in business has been Corporate Social Responsibility (CSR), a strategic management principle that transcends mere legal compliance, seeking to balance economic, environmental, and social goals (Vallaster *et al*., 2012). However, Porter and Kramer (2011) critiqued CSR for often remaining disconnected from core business strategies. To address this limitation, they proposed the Creating Shared Value (CSV) model, which integrates sustainability more centrally by focusing on generating economic value in ways that also address societal needs and challenges. More recently, the rise of Environmental, Social, and Governance (ESG) criteria has further advanced the discourse by offering a financial perspective on evaluating corporate sustainability performance. These evolving frameworks and concepts highlight the potential of sustainability as a catalyst for questioning the dominant logic adopted in business organisations and industries, as well as the need to find alternatives for effectively navigating the increasingly social and environmental demands placed on businesses today.

Sustainability encompasses multiple interrelated dimensions: ecological, economic, social, and cultural, which must be addressed in a balanced and integrated manner. Achieving sustainability is not only about reducing consumption and regenerating resources, more importantly, it involves fostering business innovation and assuming social responsibility. Business organisations need to embrace a multidimensional approach to sustainability that integrates environmental responsibility, economic viability, and societal impact. Such balanced integration is critical for developing strategies that not only advance long-term sustainable development but also strengthen organisa-

tional resilience and relevance in an evolving socio-economic landscape (Calabrese *et al*., 2018; Lv *et al*., 2018).

The realm of sustainable design has evolved significantly, aiming to transition from an initial emphasis on environmental considerations to a more comprehensive integration of economic, social, and cultural dimensions. Early approaches, such as green design and ecodesign, primarily targeted the environmental impact of products, focusing on material selection, energy efficiency, and waste reduction (Ceschin & Gaziulusoy, 2019; Vezzoli, 2022). The introduction of cradle-to-cradle design marked a pivotal shift, emphasising the entire product lifecycle and advocating for closed-loop systems where materials are perpetually reused, thereby eliminating waste (Ceschin & Gaziulusoy, 2019). This approach reinforced the necessity of considering products within a broader context and system. Subsequently, the focus expanded to embrace value creation in sustainable design, and designers began to develop solutions that not only reduced environmental harm but also delivered economic benefits, recognising that sustainable products must be viable in the marketplace to achieve widespread adoption. The sustainable design research area started to include the concept of Product-Service Systems (PSS), which strategically integrates products and services to fulfill user needs by promoting resource efficiency and reducing waste (Manzini & Vezzoli, 2003). This change acknowledges that delivering value sustainably often requires thinking beyond the traditional product-centric models.

Advancement in the sustainable design area also moves towards design for sustainable business models that align economic profitability with ecological and social responsibilities. Designing sustainable business models requires business organisations to redefine the purpose of their business and to operate differently, and design is a key strategic factor in the creation of innovative sustainable business models (N. Bocken *et al*., 2013; Boons & Lüdeke-Freund, 2013). According to Esslinger (2011), designers are particularly well positioned to advance and implement sustainable business models, as they can bridge human needs and aspirations with emerging opportunities and insights from science, technology, and business. This is what Buchanan discussed in the third and fourth orders of design (2015), emphasising the contributions of design to bringing more creative

approaches and to embracing diverse dimensions and perspectives to find solutions for complex problems. As business organisations increasingly confront the imperative of transitioning toward sustainability, there is a growing need to explore alternative approaches to collaboration, management, and operations that address the complex challenges. Therefore, design for sustainability could offer valuable opportunities to expand the current scope of strategic design and design thinking studies, particularly by revealing its current limitations in embracing sustainability issues within the value creation logic in business and industries. As argued by Cross (2023), Drew *et al.* (2022), and Fayard & Fathallah (2023), the absence of a critical and systemic perspective in design thinking can result in an overdependence on standardized methods and processes, potentially leading to superficial and short-lived solutions that fall short of generating meaningful and lasting impact.

4.2.2 Sustainable Transition as an Opportunity to Explore Strategic Design Beyond the Organisations

The challenge of sustainability is characterised by a high degree of complexity and uncertainty, and is deeply interconnected across multiple levels of operation. Thus, isolated actions by individual business organisations are insufficient to achieve a meaningful impact, and traditional ways of competition among the business organisations might limit opportunities for innovation. Instead, a systemic perspective and property (Adams *et al*., 2016) might provide an alternative – healthy competition, which becomes an engine to combine economic benefits with solving environmental and social problems (Garriga & Melé, 2004; Waheed & Zhang, 2022). By adopting a systemic approach that integrates service systems, business models, supply chains, value chains, and ecosystems, organizations can navigate the complexities of sustainability. This requires not only technological innovation but also organizational change, stakeholder engagement, and the development of new capabilities.

Open innovation, particularly inter-organization innovation transitioning from competition to collaboration, is increasingly recognised as a pivotal strategy in advancing sustainable development, particularly when viewed through an ecosystem lens. Traditional competi-

tive models often lead to fragmented efforts, whereas collaborative approaches foster integrated solutions that address the multifaceted nature of sustainability challenges. In the context of sustainability, collaboration enables diverse stakeholders, such as governments, businesses, academia, and civil society, to co-create solutions that are more holistic and effective. Central to the ecosystem concept is an ecosystem value proposition or defined system-level outcome that requires multiple actors to contribute (Talmar *et al*., 2018; Lingens *et al*., 2021). This underscores the importance of interdisciplinary collaboration and systemic thinking in addressing sustainability challenges. For instance, the concept of industrial symbiosis (Chertow, 2007) exemplifies how collaborative efforts can lead to resource efficiency and waste reduction. By sharing resources, energy, and by-products, industries can create mutually beneficial relationships that mimic natural ecosystems, thereby promoting a circular economy. Shifting from competition to collaboration is essential for sustainable development. It allows for the pooling of resources, knowledge, and expertise, leading to more resilient and adaptive systems instead of the organisation-centric perspective (Eikelenboom & de Jong, 2021).

The evolution of design for sustainability has also progressed from a focus on materials and product interventions to encompassing broader socio-technical systemic innovations. As Ceschin & Gaziulusoy, (2019) argued, addressing contemporary sustainability challenges requires multi-level design approaches that integrate products, services, systems, and societal transitions. In their framework, as design moves toward more human-centered and systemic perspectives, its strategic role increasingly extends beyond individual business organisations. Designers should engage with diverse actors and navigate complex inter-organisational networks and relationships across multiple systems. Consequently, design strategies that address service systems, business models, and wider ecosystems have become critical levers for enabling and accelerating sustainable transitions. Baldassarre *et al*. (2020) stated that designers must go beyond product-centric strategies and engage with larger socioeconomic systems, reimagining value-creation processes to integrate sustainability at multiple levels. This involves recognising the interdependencies that exist among a set of artefacts and actors, such as

producers, suppliers, business organisations, end users, products, projects, and corporate strategies in the wider value creation systems. Every level, from tactical interventions at the product level to strategic shifts at the systemic and sector level, is interconnected and mutually influential. Therefore, the current studies on designing for sustainability have gained high attention and interest in understanding how to strategically influence complex socio-technical systems through design approaches, methods, and tools, and how to carry out design interventions to foster innovation that aligns with ecological and societal goals at the broader systemic level (Ceschin, 2014; D'Itria *et al*., 2024).

Geissdoerfer *et al.* (2018) underscored the necessity of aligning business model innovation with supply chain management to facilitate sustainable transitions. Norris and Caniato (2021) argued that sustainable value creation extends beyond the focal firm to include suppliers and other stakeholders within the value chain. This holistic view requires collaborative efforts across the ecosystem, fostering partnerships that align economic, environmental, and social objectives. Konietzko *et al.* (2020) proposed design principles for circular ecosystem innovation, which prescribe how firms should collaborate and experiment via a structured trial-and-error process. An analysis of this work shows that in collaborative ecosystem design literature, sustainable design theory connects with business concepts beyond a firm-centric approach, in order to support the creation of strategic partnerships of organisations working together in the transition toward sustainable development (Baldassarre *et al*., 2020). Quint (2024) argued that a design approach could anticipate alternatives and foster collaboration for generating creative solutions for addressing the complex systemic challenges at the ecosystem level. "Design as strategy" will focus on promoting creative collaboration and partnerships for creating ecosystem solutions that drive meaningful and long-term impact. To achieve this, it is important to align design function not only with various business units but also with collaborative partnerships that extend beyond the company's boundaries.

Sustainable transition of business organisations provides the opportunity to bridge the strategic and systemic features of design, which bridges the value creation logic with the holistic approach to

tackling complex sustainability challenges. This shift acknowledges the need for further development in design areas in order to create the conditions, through engagement and leadership, to guarantee the success of design actions for systemic changes (Drew *et al*., 2022).

4.3 Design-Based Capacity Building as a Learning Process to Activate Sustainable Transition: from Organisations to Systems

Advancing sustainable transitions requires organisations to cultivate new capabilities and foster a proactive learning attitude that enables them to navigate complex and evolving contexts. This learning process is essential for making sense of sustainability challenges and for identifying and articulating innovation opportunities within dynamic socio-ecological systems. Scholars have increasingly recognised the unique contribution of design and design thinking in this regard, highlighting the distinctive features and advantages of design and design thinking in fostering organisational learning and building collaborative capacities at the systemic level (Baldassarre *et al*., 2020; Beckman & Barry, 2007; Quint, 2024). However, collaboration and the formation of new relationships demand the development of specific capabilities tailored to the demands of sustainability and transition. To address this, organisations must build competencies in three interconnected dimensions: *design as a discipline* that offers tools and methods for creative problem-solving; *design as an approach* that promotes user-centred and systemic thinking; and *design as a driver* that catalyses innovation and organisational change. Together, these design-based capacities are critical for enabling organisations to engage meaningfully with sustainability challenges and contribute to transformative change.

4.3.1 Strategic Design Capacities for Sustainable Transition

Sustainable development requires business organisations to gain new capabilities. The European Commission has published the European sustainability competence framework – GreenComp (2022)

to identify the necessary competences to learn and to gain related to sustainability. Several key competencies are highly related to the capabilities and features of design thinking and strategic design (Baldassarre *et al*., 2019; Manzini & Vezzoli, 2003).

Strategic foresight and visioning are increasingly vital for business organisations seeking to address sustainability challenges and drive transformative change (Neuhoffa *et al*., 2021). These capabilities help firms anticipate emerging trends, explore alternative futures, and align strategies to foster resilience and innovation in complex environments (Buehring & Bishop, 2020). This approach is particularly relevant in the context of sustainability transitions, where long-term planning and adaptability are crucial. By integrating strategic foresight with sustainability transition frameworks, organisations can develop actionable knowledge that addresses complex systemic challenges. Speculative design (Dunne & Raby, 2013) and design futuring (Fry, 2009) serve as critical methodologies within this foresight paradigm. These practices challenge prevailing assumptions and stimulate discourse on emerging technologies, societal shifts, and ethical considerations. By crafting tangible representations of possible futures, speculative design encourages stakeholders to reflect on the implications of current trajectories and consider alternative paths. Such approaches are instrumental in envisioning sustainable futures and fostering innovation. The capabilities associated with foresight and visioning are closely linked to strategic design, enabling organisations to collaborate effectively with stakeholders to generate shared understanding and alignment. This collaborative approach is vital for tackling systemic sustainability issues that require coordinated action. Incorporating strategic foresight into design thinking practices enhances the ability to anticipate future customer needs and adapt to changing environments (Schwarz *et al*., 2023).

Strategic foresight involves systematically examining potential future scenarios to guide present decisions and enable organisations to identify opportunities and threats and proactively shape sustainable pathways. Integrating foresight into planning processes enhances adaptability and innovation capacity, both critical for navigating sustainability transitions. Complementing foresight, visioning allows organisations to articulate aspirational future goals. Through col-

laborative approaches, visioning fosters shared understanding and organisational alignment, which are essential in addressing systemic sustainability issues requiring coordinated action (Wiek & Iwaniec, 2014). Together, foresight and visioning support the development of dynamic capabilities, including sensemaking and organisational learning, which enhance firms' ability to interpret complexity and refine strategies over time.

Effectively addressing sustainability challenges requires to develop capabilities in framing complex problems and engaging in creative problem-solving (Dorst, 2011; Seidel & Fixson, 2013). Design and design thinking offer powerful approaches to support this need by fostering an understanding of the problems and related stakeholders. This problem-framing capacity is especially important given the interconnected nature of environmental, social, and economic systems. Strategic integration of design thinking supports a culture of learning, experimentation, and collaboration across diverse teams. Liedtka (2015) emphasised that design thinking's iterative, human-centred approach drives innovation under conditions of uncertainty. Design thinking also strengthens dynamic capabilities such as sensemaking, collaboration, and adaptive learning, which are crucial for navigating uncertainty and fostering long-term transformation (Bocken *et al*., 2014). These capabilities allow organisations to go beyond incremental change and engage with sustainability in a more transformative way.

Systemic design could act as a potential response to some limitations of the current application of design thinking in the business context by merging principles of systems innovation with design thinking (Buchanan, 2019; Jones, 2014). The integration facilitates collaborative processes among stakeholders that are crucial for sustainable transformation. By engaging various stakeholders in co-creative practices, organizations can develop solutions that are not only innovative but also socially inclusive and environmentally responsible. This participatory approach ensures that diverse perspectives are considered, leading to more robust and resilient strategies for sustainable development. Incorporating design as a strategic discipline thus empowers organizations to build the necessary capacities for sustainable transition. By fostering a culture of innovation and adapt-

ability, businesses can better navigate the uncertainties of the sustainability landscape, aligning their operations with broader societal and environmental goals.

4.3.2 Design Approach to Enable Organisational Learning Towards Sustainable Transition

Organisations need to develop capabilities to adapt to complex environmental and societal challenges of sustainable transitions. Design, particularly design thinking, offers a structured yet flexible approach that fosters such organisational learning by integrating experiential processes and collaborative problem-solving. Kolb's Experiential Learning Theory (1984) provides a foundational framework for understanding how learning occurs through experience. Kolb posits that effective learning transpires through a cyclical process involving four stages: concrete experience, reflective observation, abstract conceptualisation, and active experimentation. This model aligns closely with design thinking methodologies, which emphasise iterative cycles of prototyping, testing, and refining solutions based on user feedback and contextual understanding.

In the context of sustainability, design thinking enables organisations to engage in 'learning by doing,' where teams collaboratively explore innovative solutions to complex problems. This hands-on approach not only facilitates the acquisition of new knowledge but also promotes a culture of continuous improvement and adaptability. For instance, Beukers & Bertolini, (2021) stated that experiential learning strategies, such as urban experimentation, can enhance organisational capacities to address sustainability challenges effectively. Moreover, design thinking fosters cross-functional collaboration, breaking down silos and encouraging diverse perspectives in the co-creation of problem-solving processes. This apporach is crucial for addressing the multifaceted nature of sustainability issues, which often require integrated solutions across various organisational domains. By engaging stakeholders from different backgrounds, organisations can co-create more holistic and resilient strategies for sustainable development.

The iterative nature of design thinking also supports organisational learning by allowing teams to test assumptions, learn from failures,

and refine approaches in real-time. This adaptability is essential in the face of rapidly changing environmental conditions and evolving stakeholder expectations. As suggested, integrating design thinking into educational frameworks can empower individuals to become agents of change, capable of driving sustainability initiatives within their organisations (VanGronigen *et al*., 2023). Furthermore, the reflective component of experiential learning encourages organisations to critically assess their practices and outcomes, leading to deeper insights and more informed decision-making. This reflective practice is integral to developing a learning-oriented culture that values feedback and continuous growth. By embedding such reflective processes into their operations, organisations can enhance their capacity to navigate the complexities of sustainable transition effectively.

4.3.3 Design as a Strategic Driver for Collaboration at the Systemic Level

Collaboration becomes not only a strategy but also a new subject of design itself. Relationships, both within organisations and across stakeholder networks, are increasingly recognised as artefacts that require careful design and facilitation. Designers play a vital role not merely as creators of physical or digital products, but as enablers of collaboration. Through their unique ability to understand diverse needs and mediate between different actors, designers act as facilitators who orchestrate productive interactions and foster mutual understanding across ecosystems.

This approach is strongly aligned with the concept of collaborative innovation, which has gained prominence as a response to the complexities of contemporary challenges. As (Jones, 2014) argue, the rising need for more intensive and distributed knowledge flows is a key driver of collaborative innovation. Organisations increasingly recognise that no single entity holds all the expertise necessary to tackle sustainability transitions alone. In addition to enhancing knowledge exchange, collaboration contributes to improved performance outcomes, cost reductions, and shorter time-to-market (Bititci *et al*., 2004; Pouwels & Koster, 2017). These efficiencies make collaboration not only desirable but essential in highly competitive and resource-constrained environments.

Furthermore, sharing the risks associated with innovation is another powerful motivator for collaboration. When facing uncertain and complex problems, such as those inherent in transitioning towards sustainable production and consumption patterns, distributing risks among partners becomes a pragmatic necessity (Bititci *et al*., 2004). As noted by Felin & Zenger (2014), the combination of problem complexity and the distributed nature of knowledge further reinforces the strategic relevance of collaborative approaches. By leveraging the diverse capabilities and perspectives of ecosystem actors, collaborative innovation not only becomes more effective but also more resilient in the face of dynamic and unpredictable challenges.

Designers are increasingly taking the role of facilitators to orchestrate collaboration among diverse stakeholders towards systemic change (Aguirre *et al*., 2017). This evolving role reflects the recognition that sustainability challenges are inherently complex and multifaceted, demanding collective efforts that extend beyond the capacities of individual organisations. Designers contribute to this process by creating conditions that encourage co-creation and offer spaces where stakeholders can jointly explore challenges and develop innovative responses. Their ability to visualise abstract ideas and translate them into tangible forms enhances stakeholder engagement and deepens participation in the design process. Furthermore, designers act as intermediaries who bridge various actors and foster effective communication for aligning diverse viewpoints and nurturing mutual understanding. Through guiding participants in iterative design processes, designers not only facilitate the development of solutions but also help build trust and foster shared understandings that are fundamental for sustaining collaborative initiatives. Their facilitation skills extend to managing group dynamics, ensuring inclusive participation, and navigating potential conflicts in constructive ways.

4.4 The ECODeCK Case Study

4.4.1 Introduction

The ECODeCK project was designed as a strategic and actionable initiative to address the challenges of the sustainable transition within

the manufacturing sector, with a particular focus on the fashion and furniture industries in the Italian context. Within this project, design is understood not merely as a method or tool for developing products and business solutions, but, building on the conceptual foundations outlined in the earlier sections of this chapter, as a strategic and cognitive approach. This perspective positions design as a key enabler for building capabilities required to navigate sustainability challenges and leverage emerging opportunities from a systemic perspective and vision. Specifically, the ECODeCK project seeks to support manufacturing companies in applying design as a catalyst for change across three interconnected levels: the individual, the organisational, and the systemic. Through this multi-level approach, the project aims to cultivate meaningful connections among people, organisations, and ecosystems through the lens of sustainability. In doing so, ECODeCK contributes to reframing the strategic role of design in industrial contexts towards driving collaborative, future-oriented, and sustainable innovation pathways. In this section, the ECODeCK project is presented as a case study to illustrate how the design approach 1) acts as a strategic driver for collaboration at organisational and systemic levels, and 2) supports organisations in the manufacturing industry to be aware and build essential competencies for defining business opportunities within the sustainable transition.

4.4.2 The Collaborative and Systemic Features in ECODeCK: People, Organization, and Ecosystem

The pursuit of sustainable transition is a multifaceted and systemic challenge. Therefore, the ECODeCK project proposes a multiple-level perspective that guides both the development of the design for sustainability framework and the training models for enabling sustainable transformation of the manufacturing companies. There are three essential elements that we considered in the sustainable transition from a systemic perspective: people (individual level), the manufacturing company (organizational level), and the ecosystem (systemic level).

As one of the theoretical foundations of the ECODeCK project, the Design for Sustainability interpretative model (D'Itria *et al*., 2024) has been adopted to illuminate emerging trajectories that advocate for the integration of diverse dimensions of sustainable development.

This model embraces a systemic perspective aimed at fostering a comprehensive transition towards regenerative futures that go beyond human-centred approaches. Responsibility and environmental perspectives of sustainability have been highlighted in developing business innovation from the fifth layer to the ninth layer. The objective is to promote strategic design in guiding business organisations to integrate sustainability goals in the development of business innovation, from redesigning business model patterns to collective business solutions that bring sustainability-oriented business values to the stakeholders in the ecosystem (Adams *et al*., 2016). The proposed organisation ecosystem-centric design (OECD) suggests a paradigm shift towards developing sustainable frameworks that align with environmental, social, economic, and cultural dimensions. This approach acknowledges the interdependence of all components within a system and requires collaboration across a broad network of actors, including designers, manufacturers, consumers, researchers, and policymakers. In this context, design is reframed as a strategic approach capable of enabling collaboration, facilitating stakeholder engagement, and generating shared value within complex socio-technical systems.

To achieve sustainable transformation, sustainable design actions and interventions should strategically address how relationships are configured both within and beyond organisational boundaries, while also fostering the essential competencies required to navigate complexity and transition. At the core of this process lies the individual. Individuals constitute the foundation of both organisations and broader systems, and their knowledge, attitudes, and behaviours significantly influence how these entities make decisions, respond to challenges, and initiate change (Wiek *et al*., 2011; Rieckmann, 2012). Developing key individual sustainability competencies, such as systems thinking, critical thinking, future thinking, and collaborative problem-solving, is crucial for enabling collaboration and nurturing a culture of learning and innovation (Redman & Wiek, 2021). These competencies empower individuals to understand the interdependencies within socio-technical systems and to envision and enact sustainable alternatives (Balsiger *et al*., 2017).

Within organisations, such capabilities support a shift from operations to more integrated, adaptive strategies aligned with long-term

sustainability goals (Leal Filho *et al*., 2018). Organisations serve as the context in which individuals enact sustainable practices at operational, tactical, and strategic levels. The ECODeCK project exemplifies how a design-based approach can frame this process. Through structured learning activities, the project seeks to build and assess sustainable actions by empowering individuals across various roles to co-create shared values and organisational strategies around sustainability. These activities are grounded in experiential and participatory methodologies that acknowledge individual competencies and facilitate collective sense-making and decision-making. Moreover, the learning model adopted in ECODeCK extends beyond the organisational level to engage with the broader ecosystem. It emphasises the importance of inter-organisational collaboration and stakeholder engagement in shaping systemic change. By facilitating interactions across organisational boundaries, the model supports the formation of resilient networks capable of driving innovation and accelerating sustainability transitions (Fichter & Tiemann, 2020; Bocken *et al*., 2019).

4.5 Design-Based Capacity Building Approach in ECODeCK

The ECODECK project proposes an innovative training model grounded in a design-based approach to capacity building, with the objective of enabling sustainable transformation in manufacturing contexts, particularly within the fashion and furniture industries. Central to this model is the reconfiguration of collaborative relationships across three levels: individual, organisational, and ecosystemic. By focusing on the early phases of *building commitment* and the ongoing, iterative cycle of *building and assessing*, the model seeks to activate new drivers of collaboration that go beyond conventional inter-organisational coordination. Rather than treating collaboration as a secondary outcome, it is positioned as a primary artefact of the design process, with shared value proposition development acting as the anchor around which stakeholders align their efforts and resources (Baldassarre *et al*., 2020; Geissdoerfer *et al*., 2016).

A core element of this approach is the intentional use of design to shift mindsets and foster systemic thinking. The training encourages participants to reframe problems, question existing assumptions, and identify latent opportunities in complex, interdependent systems. This reflects the strategic role of design not only as a set of tools, but as a cognitive and cultural capacity for navigating uncertainty and change (Calabretta *et al*., 2016; Liedtka, 2015). In doing so, the training model translates abstract theories and methodological frameworks into applied, experiential learning processes – embodying the principles of experiential learning theory (Kolb, 1984), which emphasises the transformation of experience through cycles of action, reflection, and conceptualisation.

The ECODECK model is explicitly designed to promote intra-departmental and inter-organisational collaboration. processes. The training process supports a dual orientation: *zooming in* to address internal structures, roles, and behaviours, and *zooming out* to engage with wider systems, including supply chains, value networks, and policy environments. This dual orientation is essential in fostering cross-boundary learning and innovation, particularly in response to sustainability challenges that transcend organisational boundaries (van der Bijl-Brouwer, 2019; Manzini, 2015). The model's iterative structure encourages participants to continuously move between localised action and broader systemic reflection, ensuring that short-term solutions are embedded within long-term, adaptive strategies.

Furthermore, the design-based training is intended to foster a culture of co-creation and mutual learning, both within and across organisations. Participants are equipped not only with design tools but also with the reflective and collaborative skills necessary to facilitate organisational transformation. As argued in the literature, the ability of design to bridge different knowledge domains and stakeholder perspectives is crucial for enabling collective experimentation and shared ownership in sustainability transitions (Deserti & Rizzo, 2014; Bocken *et al*., 2019). In this sense, design serves as a relational and enabling infrastructure that supports the formation of collaborative ecosystems capable of generating and sustaining systemic innovation.

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5. Designing Participatory Actions for Sustainable Transition

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5.1 Introduction

Sustainable transition requires design as a pivotal tool to navigate the complexities of contemporary challenges. This chapter examines how design serves as a lever for systemic change, emphasizing the interplay between participatory processes, individual competencies, organizational culture, and the broader ecosystem. Drawing on insights from the ECODeCK project, it explores how design-driven approaches can facilitate transitions toward circular and sustainable practices. The chapter explores the evolution from nurturing individual skills within organisations to fostering an organisational mindset capable of navigating and responding to complex ecosystem dynamics. Furthermore, it illustrates the importance of participatory processes in engaging diverse stakeholders, enabling co-creation, and driving innovation. It emphasises the role of deciphering ecosystems – understanding the interconnections and interdependencies within them – to identify opportunities for transformative change. This chapter positions design as a catalyst for adaptive and inclusive practices,

demonstrating its potential to empower individuals and organisations alike to address sustainability challenges.

5.2 The Urgency of Participatory Sustainability Transitions

The urgency of achieving a sustainable transition – the profound reconfiguration of systems of production, consumption, and governance toward ecological balance and social equity – has become increasingly evident across all sectors of society (Schilling *et al*., 2018).

The accelerating pace of environmental degradation and the increasing depth of social inequalities underscore the necessity for systemic change (Novaes *et al*., 2025). This necessity is amplified by contemporary economic models that are increasingly tested by both ecological and social strains (Abrahams, 2017). Yet the complexity and interdependence of these challenges render purely technical or isolated solutions insufficient. What is required is a fundamental rethinking of how change is envisioned, enacted, and shared – a shift toward approaches that are inclusive, adaptive, and rooted in real-world contexts (Young & Tilley, 2006).

Within this paradigm, participatory processes are emerging as crucial mechanisms in the realm of sustainable transitions. They facilitate an inclusive approach where a diverse range of stakeholders – including individuals, organizations, and communities – come together to co-create visions, negotiate priorities, and refine strategies that embody collective values and aspirations (Loorbach *et al*., 2017). This collaborative dynamic allows for enhanced inclusivity in decision-making, leading to more resilient and effective outcomes that resonate with the lived experiences of various populations.

By engaging multiple voices, participatory approaches not only foster mutual learning but also yield the trust and ownership essential for driving transformative change (Melles, 2019).

Within this framework, design takes a pivotal role, evolving beyond conventional notions of aesthetics and functionality to become a relational practice that unites actors across various scales of complexity (Poderi & Dittrich, 2018). Design, as both an explora-

tory practice and a mode of inquiry, supports dialogues, encourages experimentation, and cultivates adaptive learning processes. This transformative capability is particularly relevant within a sustainability context, as design enables the articulation of sustainability concepts, making them tangible and actionable within specific local contexts (Olsson *et al*., 2014). By encouraging participatory dimensions, design can effectively invite diverse stakeholders into the sustainability dialogue, thereby enhancing the potential for equitable transitions and outcomes that resonate with local needs (Saha & Paterson, 2008).

This chapter sets out to investigate how design can structure and facilitate participatory actions to forge meaningful transitions toward sustainability, reflecting the patterns of collaboration and co-creation that characterize successful initiatives.

5.2.1 Participatory Processes

A broad and interdisciplinary body of scholarship has laid the foundation for understanding participatory actions and practices as essential tools for transformative change, particularly within the intersecting domains of design, sustainability, and social innovation. This body of work reframes participation not as a peripheral activity, but as a central methodology and value orientation in contexts marked by complexity, uncertainty, and pluralism. Scholars such as Manzini (2015) and Sanders & Stappers (2008) have reconceptualized design as an inherently collaborative process – one that extends beyond professionals to include communities, users, and citizens as co-designers of solutions, to take on an active, generative role in the development of solutions. This shift toward co-creation and diffuse design reflects a growing recognition of the value of lived experience, local knowledge, and collective agency in addressing complex multidimensional societal and systemic challenges. In parallel, scholars like Wiek *et al*. (2011) and Schäpke *et al*. (2018) emphasize the importance of developing key competencies for sustainability. These include not only systems thinking and anticipatory capabilities, but also normative and interpersonal skills such as collaboration, reflexivity, and ethical reasoning. Scholars argue that these competencies are best cultivated in transdisciplinary and participatory learning environments,

where knowledge is co-produced through dialogue, experimentation, and critical engagement with real-world challenges. Contributions from Bødker (2000) and DiSalvo (2013), rooted in participatory design traditions, remind us that participation is not simply a methodological choice, but stress the situated, iterative, and political nature of engagement – reminding us that participation is deeply ethical and contextual. Their work highlights how participatory design is inherently situated and negotiated, shaped by the power relations, cultural narratives, and institutional constraints within which it is embedded. This perspective foregrounds the need to design not just for inclusion, but with attentiveness to equity, access, and the contested nature of change. Meanwhile, Fischer (2000) highlight how participatory practices intersect with governance, public innovation, and policy, where they serve as mechanisms for democratic legitimacy, institutional learning, and the construction of shared visions for the future. Here, participation becomes a bridge between policy and practice, enabling more adaptive, responsive, and context-sensitive forms of decision-making. They frame them as essential mechanisms for ensuring legitimacy, responsiveness, and long-term impact. Together, these scholars articulate a vision of participation not as a procedural step, but as a foundational principle for designing inclusive, adaptive, and socially embedded transformations. Rather than a discrete step in the design process, participation is framed as a dynamic and evolving engagement – one that shapes how problems are framed, how knowledge is generated, and how agency is distributed. This redefinition has profound implications not only for how we design, but for how we learn, govern, and transition toward more sustainable and equitable futures.

In the case of ECODeCK Project, participatory actions and practices refer to intentional, inclusive processes that actively engage diverse stakeholders in the co-creation of knowledge, strategies, and solutions (Moor, 2019). Rooted in principles of collaboration, equity, and shared ownership, these practices are not peripheral or ancillary to the project's aims – they aim to democratize decision-making and foster mutual learning across different perspectives, disciplines, and power structures (Bennett & Brunner, 2022). Furthermore, through participatory approaches, the project seeks

to bridge the gap between academic knowledge, industrial practice, and local contexts, creating learning environments that are situated, reflexive, and action-oriented. Unlike top-down approaches, participatory actions in ECODeCK are structured around co-design and capacity-building methodologies, and are built on dialogue, reciprocity, and trust, creating spaces where all actors – whether individuals, organizations, or communities – can meaningfully contribute to defining both problems and responses. In the context of sustainability and systemic transformation, participatory practices are essential for ensuring that solutions are contextually relevant, socially legitimate, and adaptable over time (Kaur & Lodhia, 2018). Moreover, they serve to identify and redistribute decision-making power within organizational structures, supporting cultural change and the emergence of new professional competencies. ECODeCK uses participation as a mechanism to nurture transdisciplinary learning, enabling professionals to engage with complexity, experiment with design tools, and reflect critically on their roles in sustainability transitions. Thus, these practices include a wide range of methods such as co-design workshops, stakeholder mapping, participatory scenario planning, and community-based prototyping, each enabling a deeper engagement with complexity and a stronger commitment to collective change. *Participation in ECODeCK is therefore both a method and a goal: it ensures that models are not only context-sensitive and feasible, but also that they cultivate a sense of agency and shared responsibility for long-term transition. Ultimately, within ECODeCK, participatory actions are not solely about inclusion – they are designed to build capacity, activate agency, and foster accountability across multiple levels of intervention. They support a shift from isolated sustainability efforts to collaborative, multi-scalar strategies, where innovation emerges through dialogue and where transformation is not imposed, but co-produced*. This approach aligns with ECODeCK's broader vision of design as a systemic enabler of change – one that mobilizes people, structures, and relationships toward regenerative and just futures.

5.3 Building Participation: from Individual Competencies to Ecosystemic Transformation

Achieving systemic change through design does not begin at the level of products, technologies, or even external partnerships – it commences from within (Redman & Wiek, 2021).

Achieving systemic change through design does not begin at the level of products, technologies, or even external partnerships – it commences from within (Redman & Wiek, 2021). This means that meaningful transformation must first occur at the level of individual mindsets, values, and behaviours. Systemic change is often interpreted as large-scale restructuring of systems – such as supply chains, policies, or market dynamics – but such shifts are unsustainable or superficial if they are not rooted in the daily decisions, assumptions, and practices of the people involved. On a practical level, this implies that before an organization can reorient its strategies around sustainability, or a community can adopt circular economy principles, the individuals within those systems must be able – and willing – to question inherited norms, unlearn unsustainable habits, and embrace new ways of thinking and acting. This inner transformation involves developing the capacity for critical reflection, accepting uncertainty, cultivating empathy, and aligning personal choices with collective values. In the context of design, it means that practitioners, leaders, and stakeholders must not only design sustainable solutions, but also embody the principles they seek to promote. Without this foundational shift, systemic interventions risk being resisted, misaligned, or short-lived. Thus, the transition toward sustainable futures is not only a matter of shifting production systems or adopting circular practices but also of cultivating new ways of thinking, working, and relating across all layers of an organization. Here, participation is seen as both an internal and external process. Internally, it involves equipping individuals with the capacity to act and transforming organizational cultures to support inclusive, reflective, and adaptive forms of engagement (Venn *et al*., 2022).

In the ECODeCK project, this dual focus is embodied in the integration of individual competence development and strategic

organizational change, forming the basis of a training model that is as concerned with people as it is with structures and systems.

5.3.1 Developing Individual Sustainability Competencies

The capacity of individuals to actively engage in sustainability transitions hinges on their ability to navigate complexity, manage contradictions, and collaborate across boundaries (Hyytinen *et al*., 2023). These capabilities cannot be reduced to technical expertise; they require a broader set of cognitive, ethical, and relational skills that allow professionals to respond with agility and awareness to evolving sustainability contexts. The ECODeCK project addresses this need through the Sustainable Transition Comp (ST Comp), a competence framework that defines essential dimensions of individual sustainability capacity: values, systems thinking, design processes, and agency. The "Values Pillars for Sustainability" competence area focuses on cultivating ethical awareness and responsibility. It encourages learners to critically reflect on the values that shape decision-making – such as fairness, stewardship, and intergenerational justice – and to recognize their implications in everyday organizational practices. It challenges professionals to move beyond abstract principles and consider how sustainability is framed, narrated, and enacted through the stories, norms, and metrics that govern their work. "Thinking Style for Sustainability" introduces systemic, critical, and exploratory thinking as foundational mindsets for sustainability-oriented action. Individuals must learn to see the interdependencies between social, ecological, and economic systems and to anticipate the ripple effects of their decisions across time and space. This dimension trains people to question dominant narratives, uncover hidden assumptions, and explore plural futures, supporting informed, reflective, and transformative choices. The third area, "Design Processes for Sustainability," equips learners with design literacy – an understanding of how to frame problems, imagine alternatives, prototype solutions, and iterate within real-world constraints. This includes the ability to apply design tools such as stakeholder mapping, life cycle thinking, and scenario planning not just as methods but as ways to shape conversations and support shared understanding among diverse actors (Lvova *et al*., 2020). Finally, "Agency for Sustainability" focuses on the capacity to take initiative and lead

change. It promotes not only individual responsibility but also the skills needed to mobilize resources, facilitate collaboration, and engage constructively with resistance. Agency is framed as both personal and collective: the ability to act in alignment with one's values and to do so in ways that inspire and support others to act. These four competence areas are not taught through abstract instruction but through participatory, experiential, and project-based learning activities. ECODeCK's design-based training model encourages learners to engage with real sustainability challenges drawn from their industrial context. Through hands-on projects, learners are invited to co-create solutions, reflect critically on their process, and iterate in response to feedback. This active learning environment fosters deep engagement and long-term learning by linking theory and practice, individual insight, and collaborative inquiry. Participation becomes not only a pedagogical method but a transformative experience – one that builds confidence, ownership, and reflexivity among trainees (Cebrián *et al*., 2021).

Thus, the ECODeCK project highlights the central role that developing individual sustainability competencies plays in advancing systemic transformation. Through a participatory, experiential, and design-based approach, ECODeCK fosters the integration of sustainability into professional practice as a dynamic and actionable capacity rather than as static knowledge. By engaging directly with real-world challenges, participants strengthen critical areas such as ethical awareness, systems thinking, design literacy, and agency. Participation is not treated as an additional learning method but is embedded as a core mechanism for building deeper engagement, reflexivity, and collaborative problem-solving. It allows individuals to connect theory with practice, develop critical perspectives, and contribute proactively to sustainable innovation within their organizations and sectors. By focusing on individual competence development through participatory actions, ECODeCK seeks to create the conditions for long-term cultural and organizational change, supporting more adaptive, inclusive, and resilient approaches to sustainability transitions.

5.3.2 Transforming Organizational Culture

While building individual competence is necessary, it is not sufficient for sustainable transformation. The culture of an organization – its

shared assumptions, routines, and informal norms – plays a powerful role in shaping whether and how new ideas are embraced, challenged, or ignored (Hagmaier, 2019). In many cases, organizational culture can act as a barrier to sustainability, reinforcing short-term thinking, hierarchical decision-making, or a narrow focus on efficiency. For participatory sustainability practices to flourish, organizations must be deliberately reoriented to support learning, experimentation, and distributed leadership (Lozano *et al*., 2019). ECODeCK's approach to design-led capacity building addresses this challenge by positioning design not simply as a toolkit but as a cultural practice that can shift how organizations think and operate (Redman & Wiek, 2021). Design encourages a mindset that is collaborative, exploratory, and open to ambiguity – a vital counterpoint to the rigidity and linearity that often characterize industrial management. By embedding design as a strategic function, organizations can begin to develop cultures that are more inclusive, reflective, and adaptive. Transforming culture begins with creating enabling conditions for participation. This involves not only providing tools and training but also embedding participatory structures into the rhythms and rituals of the organization: regular co-design sessions, feedback loops, open forums, and reflective practices that invite multiple voices into the process (Nair & Bhattacharyya, 2022). Over time, these actions contribute to a shift in culture – one where participation is no longer an exception but becomes a way of working. Moreover, a participatory culture must be actively supported by strategic leadership that embraces design as a mindset and method. Leaders play a critical role in signaling the value of participation, allocating time and resources for collaborative processes, and modeling the openness and curiosity that participatory approaches require. This kind of leadership is not about control or expertise – it is about facilitation, empowerment, and sense-making (Dlouhá *et al*., 2019). Strategic design leaders help organizations navigate uncertainty, align diverse interests, and sustain momentum across complex transitions. The integration of participatory design thinking within organizations allows for a shift from reactive problem-solving to proactive transformation. It enables organizations not only to comply with sustainability pressures but to anticipate change, co-create value with stakeholders, and cultivate long-term resilience.

In this way, participation becomes not only a method but a strategic asset, shaping how organizations learn, adapt, and evolve.

5.3.3 Designing for Collective Engagement

In the context of sustainability transitions, collective engagement is not just a desirable feature – it is a structural necessity. Designing for collective engagement means actively involving a diversity of stakeholders in the identification of problems, the framing of opportunities, and the development of solutions (Trana *et al*., 2024). It acknowledges that sustainable transformation cannot be imposed from the top down or achieved in isolation. Rather, it must emerge from a process of inclusive dialogue, negotiation, and co-creation that is embedded in specific contexts and responsive to the complexity of socio-technical systems. Participatory design methods provide a powerful framework for stakeholder inclusion. These methods invite individuals and groups from different backgrounds – such as employees, suppliers, users, local communities, and policymakers – to contribute their knowledge, experiences, and aspirations to the design process (Fobbe & Hilletofth, 2022). Approaches such as stakeholder mapping, design charrettes, co-design workshops, and scenario planning allow for the surfacing of tacit knowledge, the exploration of alternatives, and the collective imagining of desirable futures (Koistinen *et al*., 2019). These methods not only democratize design but also improve its relevance and legitimacy by aligning solutions with the values and needs of those affected. Within these participatory processes, a key goal is to create tools and practices that foster shared ownership of both challenges and outcomes. Visual thinking tools, journey mapping, storytelling, and speculative design artifacts can support participants in articulating perspectives, building empathy, and navigating ambiguity (Kaur & Lodhia, 2018). These tools help make complex systems more understandable and negotiable, and they create a common language that enables meaningful collaboration. Through iterative cycles of making and reflecting, participants develop not only solutions but a sense of belonging and commitment to the change process itself. However, collective engagement also means encountering and working through diverse – and sometimes conflicting – perspectives. Participation alone does not guarantee consensus. The role of design, in

this context, is not to eliminate difference but to create spaces where difference can be surfaced, explored, and transformed into productive dialogue (Ferrero-Ferrero *et al*., 2018). Trust-building is therefore a foundational process in participatory design: it requires transparency, mutual respect, and attention to power dynamics. Facilitators must be equipped to manage conflict constructively and ensure that all voices, especially marginalized or less powerful ones, are heard and valued.

5.3.4 From Organization to Ecosystem: Scaling Participatory Actions

While much of the discourse around sustainability begins at the level of individual behaviour or organizational reform, real and lasting transformation requires a broader view – one that sees industrial ecosystems as complex, interdependent systems of actors, practices, infrastructures, and regulations. These ecosystems, particularly in sectors like fashion and furniture, are deeply embedded in global value chains yet strongly influenced by regional socio-cultural dynamics (Bocken *et al*., 2019). As such, they are not just contexts in which change happens, but active sites of transformation themselves – spaces where collaboration, experimentation, and strategic alignment can catalyze large-scale impact (Hinderer *et al*., 2021). The Design for Sustainability (DfS) Framework, developed through the ECODeCK project, provides a roadmap for engaging with this complexity across three progressive levels of intervention: the product level, where design addresses material, technical, and functional aspects of sustainability; the organizational level, where design informs strategy, processes, and culture; and the ecosystem level, where design becomes a tool for navigating inter-organizational dynamics and enabling cross-sectoral collaboration (D'Itria *et al*., 2024). This multi-scalar model helps actors locate themselves within a broader transition pathway, understand the interplay between their internal actions and external systems, and coordinate efforts accordingly.

Within this framework, participatory actions play a critical role in enabling sustainability transitions. They act as connective tissue across systems and scales, fostering engagement between diverse stakeholders – including designers, producers, policymakers, re-

searchers, educators, and communities – who might not otherwise collaborate. These interactions allow for the emergence of shared understanding, co-created knowledge, and mutual accountability in shaping sustainable futures. Participatory approaches provide opportunities to address the practical realities of production while also navigating the institutional, cultural, and ecological parameters in which firms operate. In doing so, they support the design of sustainability strategies that are not only operationally viable, but also context-sensitive and socially legitimate.

Importantly, participation at the systemic level reinforces the idea that organizations are not just recipients of external pressures or passive implementers of sustainability frameworks. They are, in fact, active levers of transformation – capable of reshaping the ecosystem in which they are embedded. When organizations engage in participatory processes that extend beyond their immediate boundaries, they contribute to building shared infrastructures, fostering cross-sectoral learning, and shaping the norms, narratives, and incentives that govern collective action. This reinforces the potential of organizations to influence institutional configurations and policy ecosystems, thereby amplifying their role in systemic change. Moreover, participatory processes may encourage distributed agency by empowering multiple actors to contribute to transition processes from their respective positions, thus multiplying impact and enhancing resilience (Jokinen *et al*., 2021).

Design plays a pivotal role in structuring these participatory encounters and scaling them effectively. Through tools such as ecosystem mapping, systems modeling, and transition pathway design, it becomes possible to visualize connections, identify leverage points, and reveal opportunities for coordination and innovation. These methods help move beyond isolated pilot projects or isolated sustainability efforts toward coherent, system-wide strategies that align policy, business innovation, and societal engagement (Schilling *et al*., 2018). In this way, design is not only used to solve problems – it helps define enabling conditions for transformation, shaping how networks function, how knowledge circulates, and how shared goals are constructed and pursued (Duan, 2023). In the context of ECODeCK, participatory action becomes both method and outcome – a process

that empowers organizations to operate as change agents, and a mechanism for embedding sustainability within industrial ecosystems. By focusing on ecosystem-level thinking, the ECODeCK project highlights the importance of designing platforms and infrastructures that support long-term collaboration, adaptability, and institutional learning. This includes not only tools and frameworks but also processes for aligning policy agendas, funding mechanisms, and capacity-building efforts across. Ultimately, scaling participatory action means designing not just better organizations or products, but better systems – systems that are open, inclusive, and capable of evolving in response to ongoing social and environmental challenges.

5.4 Design as an Enabler of Participatory Transition

The participatory actions developed and tested through the ECODeCK project offer critical insights into how design can catalyze meaningful and durable transformations toward sustainability. *One of the key learnings is that transition is not a linear process, nor one that can be driven by isolated interventions (Aguiar* et al*., 2020). Instead, it must emerge through the continuous interaction of individuals, organizations, and ecosystems, each contributing unique perspectives, capabilities, and responsibilities to the shared task of transformation (Hockerts & Wüstenhagen, 2010)*. The project's design-based approach has shown that when participation is intentionally cultivated and supported by the right tools, it becomes a powerful engine for inclusive innovation and systemic resilience. Crucially, ECODeCK demonstrates the value of integrating participation across multiple levels. At the individual level, participants engage in experiential learning that develops not only their technical knowledge but also their ethical awareness, critical thinking, and capacity for agency. At the organizational level, companies reflect on internal cultures and activate cross-functional collaboration as a core component of sustainability strategy. At the ecosystem level, the project creates opportunities for dialogue across firms, sectors, and communities, building shared understanding and generating conditions for

collective experimentation and long-term alignment. This multi-level integration is made possible by the project's commitment to iterative, adaptive, and situated approaches. Rather than prescribing universal solutions, *ECODeCK fosters processes that are context-sensitive and open to change. By working closely with participants and stakeholders in real settings – factories, workshops, professional networks – the project acknowledges the complexity and specificity of each sustainability challenge*. Design tools such as mapping, scenario building, and reflective evaluation enable a constant cycle of learning and adjustment, making the process responsive to emerging insights and shifting conditions. This emphasis on iteration enhances the quality of outcomes and ensures that change is grounded in lived experience and collective ownership. Ultimately, the project points toward the necessity of designing long-term capacity for collaborative transformation. This means creating infrastructures – not only physical or digital but also organizational and relational – that support ongoing learning, dialogue, and coordination. It means investing in practices and competencies that endure beyond the duration of a project, embedding sustainability into how people think, decide, and act together (Escobar, 2011; Irwin *et al*., 2018). Inclusive and regenerative futures will not emerge spontaneously; they must be cultivated through design, supported by participatory structures that enable communities and industries to evolve with care, creativity, and shared purpose.

As sustainability challenges grow in scale, complexity, and urgency, the role of design must evolve accordingly. This chapter reaffirms the transformative potential of participatory design as a strategic practice – one capable of enabling inclusive, systemic, and forward-thinking transitions. Far from being confined to aesthetics or technical functionality, design emerges here as a process of inquiry, collaboration, and sense-making that empowers individuals, mobilizes organizations, and connects ecosystems in the pursuit of sustainable and regenerative futures. The experiences and insights generated through the ECODeCK project underscore that sustainability cannot be delivered through top-down directives or isolated innovations. It must be co-created through processes that value diversity, foster trust, and engage with complexity. Participatory design offers meth-

ods, mindsets, and tools for doing precisely that. It creates conditions for dialogue across disciplines and sectors, encourages iterative and reflective practice, and transforms abstract goals into actionable pathways. The implications of this approach are significant across education, policy, and industry. In education, it calls for pedagogical models that center experiential learning, transdisciplinary collaboration, and critical agency. In policy, it advocates for frameworks that are flexible, inclusive, and attuned to context (Khan *et al*., 2020). In industry, it demands cultural and structural shifts that embed sustainability into core strategies – not as compliance but as purpose. Across all domains, participatory design supports a culture of collaboration, care, and systemic innovation – one where transformation is not only possible but collectively owned (Cottam, 2018). Looking forward, the challenge is not only to implement new tools but to scale impact while sustaining engagement over time. This means investing in long-term capacity-building, fostering enabling infrastructures, and strengthening the networks and relationships that make participatory processes viable and meaningful. It requires a continued commitment to learning, openness, and experimentation. As discussed in this chapter, design – when approached in a participatory, systemic, and intentional way – has the potential to act not only as a response to crisis but also as a guiding force for transition. It can help us imagine and enact futures that are not only more sustainable but also more just, resilient, and alive with possibility.

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6. Designing New Creative Processes for Sustainable Transition

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6.1 Introduction

In the face of accelerating environmental degradation, deepening social inequalities, and the depletion of critical resources, it has become abundantly clear that companies and organisations must urgently engage in a sustainable transition. The climate emergency and biodiversity loss are no longer distant threats – they are present and escalating realities that call for transformative action. Institutions such as the European Union have already begun to take decisive steps. The EU Green Deal, for instance, sets an ambitious goal of reaching climate neutrality by 2050, aiming to decouple economic progress from the exploitation of natural resources (European Commission, 2019). Yet, these initiatives, while necessary, mark only the starting point of a much deeper and more fundamental transformation. To date, many sustainability efforts have operated within a framework of damage control – reducing emissions, minimizing waste, increasing efficiency (Rockström and Sachs, 2013). While valuable, these actions are no longer enough to reverse the damage already done or to build

resilient systems for the future (e.g.,Alvaredo *et al.* 2018; IPBES 2019; IPCC2022; Rockström *et al*., 2023 as cited by Grund *et al*., 2023). We are at a juncture where mitigation and harm reduction must give way to rethinking our role on the planet; a cultural and cognitive shift capable of inspiring new behaviours and mindsets is needed (Romero *et al*., 2023) to establish a more hopeful and regenerative way of engaging with the natural world (Reed, 2007).

6.1.1 A Paradigm Shift: from Sustainability to Regeneration

While the term *sustainability* has become a cornerstone of contemporary discourse in policy, business, and education, its capacity to inspire and guide meaningful transformation is increasingly questioned (Wahl, 2019; East, 2020). Sustainability, as often practised, tends to focus on maintaining balance, reducing harm, and slowing down degradation. However, in a world already facing ecological overshoot, systemic inequity, and cascading crises, sustaining the current state is not only insufficient – it is no longer desirable. The concept of regeneration offers a more compelling and ambitious alternative (Robinson&Cole, 2015). Rather than aiming to preserve existing conditions, regeneration seeks to restore, renew, and revitalise systems – natural, social, and economic alike (Reed, 2007). It emphasizes a dynamic, co-evolving (Mang & Reed, 2011) and participatory relationship between humans and the planet, one in which we are not external observers or managers, but integral co-evolving participants (Plaut *et al*., 2012)

Regenerative thinking is grounded in a deep understanding of living systems (Benne & Mang, 2015). It moves beyond sustaining what remains, toward restoring what has been lost and generating conditions for life to thrive. Regenerative thinking embraces the dynamic interdependence of living systems, recognizing that humans are not separate from nature but embedded within it (Gibbons, 2020). It invites us to shift from a mindset of control and extraction to one of participation, reciprocity, and care (Svec *et al*., 2012). Regeneration is not limited to physical restoration of landscapes and habitats – it is a holistic process that includes cognitive, cultural, social, and economic dimensions. It requires a shift to redefine our role and responsibilities within Earth's web of life (Capra, 1996) for a continual proliferation of

whole-system health and wellbeing (Gibbons, 2020; Sterling, 2003). Organisations have a critical role to play when facing a sustainable transition, as they are in a unique position to reimagine their purpose and strategies, aligning their economies with ecological and regenerative principles (Shannon *et al*., 2022). Rather than simply reducing their environmental footprint, they must actively contribute to the vitality of the ecological and social systems they are part of and restore what has been lost. This requires building futures that are not only less harmful but fundamentally restorative, inclusive, and adaptive. The task is no longer just to *do less harm*, but to participate in processes that generate more life, cultivating systems that thrive. This shift demands a corresponding transformation in capabilities, developing a ways of thinking and acting that embrace the uncertainty and complexity of futures, work across disciplines, and invite collaboration beyond borders. It calls for an evolution in how we learn, think, and act. As Sterling (2011) suggests, this is a matter of what he calls *Level III learning* – not just doing things better or differently, but rethinking the very values and worldviews that shape our behavior, enabling us to respond meaningfully to the complexity of planetary life. It requires what Bohm (1980) refers to as a continuous unfolding of our consciousness, enabling us to perceive ourselves as part of an interconnected whole. This means that it becomes paramount for change-makers and creators to acquire a new set of skills to master this transition and enabling people to change their behaviour. In this context, creativity and imagination emerges as the most important skill (WEF, 2020) and key lever for change in order to ensure a sustainable and regenerative transition (Canina, Bruno & Efremenko, 2021; Fantini van Ditmar & Toivinen, 2024). It is considered our uniquely human capacity to imagine, shape, and navigate complexity and uncertainty, enabling people to envision alternative paths, adapt to disruption, and co-design new possibilities. However, our current and anthropocentric conception of creativity is not sufficient to meet the needs of a regenerative transformation. *Creativity requires a deep transformation in how it is understood*; it must be coupled with new knowledge, skills and attitudes related to ecosystem interdependence, long-term thinking, among others. Therefore, the main question addressed in this chapter is the following*: What new requirements*

must creativity embrace to become a driver of regeneration? The first part of the chapter explores how creativity must itself be redefined to support regenerative transformation: how it must evolve from being a source of innovation to becoming a distributed practice that fosters co-evolution between people, places, and the planet. *Creativity also requires a deep transformation in the way it is activated and guided*. Design, as a field concerned with empowering creativity and design skills for innovation, holds transformative potential in this context. Designers are increasingly being called upon not only to solve problems but to facilitate transformation (Miller & Baumber, 2024). As design researchers and educators, we should pose the following questions: *How could design empower regenerative creativity skills, mindset and behaviours? What new models and methodologies?* The second part of the chapter will present a design-oriented regenerative creative process, developed within the ECODeCK project, demonstrating how design can guide the sustainable transition through people's creative empowerment. Designed to foster behavioural change towards sustainability and regeneration and unlock the creative potential of people, this model can serve as a reference point for developing new educational formats capable of forming the next generation of regenerative thinkers and designers.

6.2 Beyond Generative: Toward a Regenerative Creativity

Creativity, the generation of novel and useful ideas (Amabile, 2012), has been widely studied by different disciplines, which leads to it becoming a complex and multidimensional concept (Bruno, 2021). According to the most common definition of creativity (Runco & Jaeger, 2012), it represents the ability to discover something new, to adapt one's available knowledge purposefully and to generate wild ideas to solve the problems in an original, flexible and effective manner. Creativity unfolds through a process which tends to occur in a sequence of stages (Sawyer, 2012) including both a problem-finding and a problem-solving approach. When we define creativity and innovation, it is essential to take into consideration the social, cultural

and economic context in which we live. In fact, with human evolution, there are new domains in which creativity is often expressed, such as politics, digital technology, moral and everyday life (Runco, 2017) and its definitions have to evolve and fluctuate over time (Runco, 2017). The complexity and urgency of today's global challenges related to climate breakdowns, social fragmentation and ecological decline, demand a profound shift in how we understand and apply creativity. Traditional notions of creativity, often focused on generating novel and useful solutions, are no longer sufficient when addressing systemic problems that threaten the very foundations of life on Earth. This means stepping outside the boundaries of the known and rethinking creativity not merely as a tool for creative problem-solving, but as a Post-Antropocentric process for systemic transformation (Canina, Bruno & Glaveanu, 2023). In this new context, *creativity becomes not just a competitive advantage but a collective responsibility to regenerate the health of both human and natural communities*. This demands a move toward regenerative modes of living, working, and innovating, which requires going beyond familiar solutions and imagining radically different futures. The organizations that will thrive in this transition are those that recognize creativity as a key capacity for reimagining and redesigning the structures, products, services, and relationships that shape our lives. Many companies and institutions have already acknowledged that creativity is essential for navigating this volatile environment. However, tapping into creative potential requires a strategic and cultural shift (see Chapter 7). *Organisations must foster cultures where innovation aims to regenerate the environment, meaning it should not only avoid harming the planet but also actively restore and enhance it*. Regenerative innovation prioritizes creating positive, long-term benefits for both nature and society (Thomas, 2025). This redefinition of creativity has implications across all sectors but is particularly critical in design and innovation fields, as design, in its essence, is a practice of shaping futures. Also, future design professionals should support organizations and society in facilitating the regenerative transformation. This means supporting organizations in rethinking their missions, reframing challenges, and developing new mindsets that recognize interdependence, equity, and long-term well-being as central design criteria. Therefore, it is

essential for design research to understand and investigate how creativity is evolving and what are the components that have to be nurtured in order to develop a regenerative creativity behavior and approach.

6.2.1 Components/Elements of Regenerative Creativity

Regenerative creativity requires a shift in people's mindsets and behaviours. In this section are described the fundamental aspects that influence a regenerative creative process: I) the application of a future oriented imagination to be able to create regenerative futures, visions and scenarios II) the understanding that humans, nature and all the living organisms are part of a unique ecosystem and actors of the creative process III) the nurturing of regenerative values and mindset to be able to drive a purpose driven innovation.

Applying a Future-Oriented Imagination

The future is underpinned by uncertainty, complexity and wicked problems influenced by socio-economic, political and rapid technological changes. It appears less as a fixed destination and more as a space of potential, shaped by the choices we make today. With regard to the sustainability challenges we are facing today, we must ask ourselves: *What kind of futures do we want to create? Are we merely delaying systemic collapse, or are we actively designing futures that are inclusive, regenerative, and resilient?*

To answer these questions and engage with such challenges, individuals, companies, organisations and society in general must learn to navigate the multiplicity of uncertain futures and imagine possible scenarios that could guide regenerative innovation. *Regenerative creativity and innovation require a future-oriented imagination to anticipate strategies for building regenerative and healthy futures*. This means – developing fluency in futures thinking and the creative agility to envision what has not yet been imagined. Futures thinking and methods could bring further richness to regenerative thinking and practice (Slaughter and Bussey, 2005; Camrass, 2020). *Understanding the future as something we co-create rather than predict opens up space for empowerment and collective responsibility*. The future can be understood, explored, mapped and even

created (Slaughter, 1998) inviting us to explore alternatives in a deep, layered manner.

> **In the context of transitioning to more hopeful and regenerative ways of engaging with the natural world, futures studies provides the "tools for human beings to grasp their historical predicament, respond to it and move on to new stages of civilised life" (Slaughter, 1998, p. 373). Camrass, 2020**

Futures studies emphasize that we do not face a singular pre-determined future, but rather a plural *futures* (Ramos, 2006) each shaped by values, decisions, and cultural narratives. Through participatory and action-based methodologies (Ramos, 2017), people are not only invited to reflect on possible trajectories but also actively engage in shaping them. This process involves integrating diverse perspectives, fostering a sense of agency, and constructing shared visions that can catalyze deep transformation – both individually and collectively.

Crucially, the creative act of imagining distant or unconventional futures can liberate people from pre-existing ideas and boost creativity in many ways (Koh & Leung, 2019). Imagining an unexpected future, different from the present, can help us take leaps forward, and imagining multiple alternative futures can liberate our thinking and inspire us to try something new (Chiu, 2012). Futures thinking is therefore a component of creativity (Hiltunen, 2021) and regenerative creativity, encouraging a creative mindset to generate transformative scenarios.

Embracing a Systemic Multispieces Perspective

To build regenerative futures, there is a growing need to move beyond human-centred approaches in design and creativity. Humans have traditionally been a central figure in the creative design process, where innovation has been centred on human needs, desires, hopes and aspirations. Today, as we move towards a sustainable transition and a regeneration, we need to develop an environment-centred approach (Sznel, 2020) when approaching innovation, taking other species intelligence into account (Bridle, 2022).

Regeneration requires an expanded awareness and an establishment of a new approach – one that *recognises humans as part of, not*

separate from, complex ecological systems. This shift calls for a deeper understanding of the connection and interdependence between human and non-human life forms, and an ethical reconsideration of the relationships that sustain life on Earth.

As a consequence, it is no longer sufficient to view knowledge and creativity as uniquely human capabilities. Scholars working within post-humanistic studies, are trying to redefine what and who has the capacity to produce knowledge and engage in the creative thinking process, where new materialisms and ecologies thrive (Ulmer, 2017). Scholars and designers are beginning to acknowledge that creativity emerges from the interaction of multiple agents – human, non-human, and material. Bruno Latour (1996) in his actor-network theory (ANT) has emphasized that both humans and non-humans hold agency and advocated for a deeper understanding of the relations between these assemblages. In this view, knowledge is generated not only through human cognition, but also through sensory, material and affective exchanges within ecosystems.

This reconceptualization opens space for plants, animals, landscapes, and even weather systems to be understood as active participants in shaping futures. Regenerative creativity thus becomes a distributed process – one that arises through entanglements with the living world (Milkoiret, 2017) that produces hybrid knowledge and experiences.

Nature as a non-human agent "can influence the imagination, too: our experience of or interactions with plants and animals, flooding rivers, disappearing lakes, and rising oceans, soil, mountains and glaciers, weather, climate and seasons, volcanic eruptions, a starry night sky" (Milkoreit, 2017, p. 5).

However, integrating non-human perspectives into design is not without challenges. Traditional Human centred design methodologies – such as interviews, surveys, or visual observations – are deeply rooted in human experience can unintentionally perpetuate patterns of overconsumption or exclusion. Regenerative creativity must therefore develop new tools and frameworks that incorporate ecological data, indigenous knowledge systems, multispecies awareness, and insights from sustainability science. It must also embrace methodologies that foster systemic thinking to recognise that the

entirety is interconnected – every design decision has cascading effects across natural and social systems. In this light, designers are no longer isolated problem-solvers, but co-creators embedded within living systems, influencing and being influenced by the environments they inhabit. It is the role of design to move beyond human needs and human experience. Thus, regenerative creativity can help us develop and implement ecological forms of intelligence and thus move to a new form of consciousness and knowledge formation. By embracing a more-than-human perspective – i.e., an approach that includes perspective from nonhuman "which can include animals, plants, micro-organisms, climatic systems, ecosystems, or technologies" (Grusin, 2015, p. 7) – regenerative creativity pushes us to cultivate new forms of consciousness – ones that are attuned to reciprocity, interdependence, and care. This paradigm shift not only enriches the creative process, but also lays the foundation for more just, resilient, and truly regenerative futures.

Nurturing Regenerative Values

Regenerative creativity cannot emerge without a foundational shift in values. At its core, creativity is driven by intrinsic motivation – an internal desire to make meaning, explore and contribute – which is essential not only for initiating the creative process but also for sustaining engagement throughout it (Amabile & Pratt, 2016). In the context of regeneration, this motivation must be anchored in deeper, purpose-driven inquiry: *Why are we doing this, followed by what should we be doing?* (Wahl, 2016). These questions prompt a re-evaluation of the intentions behind creative acts and invite a broader ethical and ecological awareness.

In this light, Candy's (2014) perspective on the role of futurists is particularly relevant. He believes that designers engaging with future thinking have to facilitate exploration of the future keeping the attention focused on process rather than product. This process perspective encourages us to ask whether a truly regenerative future is possible without a parallel shift in human consciousness and values – from extractive to regenerative mindsets. Regenerative futures require not just technical innovation but a heightened awareness of our place in complex living systems, inviting us to ask whether long-

term ecological healing can occur without profound inner growth and responsibility.

Developing regenerative values means recognizing our embeddedness within a web of life that includes not only human communities but also non-human systems and species. It calls for a moral realignment that prioritizes integrity, justice, and non-violence in how we design, think, and live. Learning with and from local ecological communities supports the emergence of these values, grounding them in lived experience and reciprocal relationships. Ultimately, regeneration is not merely a technical or aesthetic goal, it is a way of being. Regenerative creativity arises from this ethical foundation – a commitment to designing futures that are inclusive, life-affirming, and continuously evolving in harmony with the systems they inhabit.

6.3 Fostering Regenerative Creativity Through Design: the ECODeCK Model

In this context of transformation, design plays the pivotal role of a medium through *which regenerative creativity can be channeled, oriented and made operational*. While regenerative creativity represents the generative force – the ability to imagine, invent and reframe regenerative futures – *design offers the processes, tools, and methodologies to steer this energy towards concrete, meaningful transformation*. Therefore, in an era marked by the urgency of transformation, it becomes crucial for design research to understand how to act as a catalyst for enabling a shift of behaviours and mindset toward regeneration. Designers are increasingly called to become facilitators of regenerative futures – equipped to guide individuals and organizations in navigating uncertainty, cultivating imaginative capacity, and aligning long-term vision with transformative action. Therefore, there is a growing need for educational models rooted in art and design (Fantini van Ditmar & Toivinen, 2024) that empower professionals to act as catalysts of sustainable and regenerative transformation within organisations and society at large.

This is one of the main goal of the ECODeCK project, educating people for a sustainable and regenerative transition through creativity and design empowerment. The project developed an educational model that empower people to creatively design preferable futures – where innovation is regenerative and value-driven – to benefit both the health of the people and the planet. At the core of the model lies a regenerative creative process aiming at fostering people's regenerative creative attitudes, which is illustrated and described in this section of the chapter. To enable a design and creative approach to sustainability and regeneration, and a behavioural change, the model has been built by integrating different theories and elements, each one with a crucial role:

- **a transformative learning theory** (Mezirow, 1997; Mezirow, 1991) to transform mindset and behaviours, which has been used as a basic theoretical structure of the process;
- **the design thinking approach and methods** to foster creative and strategic thinking, which have shaped the structure of the process to make it design-oriented and produce innovative ideas. Design methods also influence engagement throughout the process;
- **the specific components of regenerative creativity,** described above, which have shaped the contents and outcomes of the process, making sure that the regenerative innovation is value-driven, future-oriented and considers multiple stakeholders perspective.

The result of this integration is a regenerative creative design process where regenerative creativity is channeled through design methods and approaches. People going through this process are at the same time envisioning regenerative futures and transforming their behaviour and mindset towards regeneration. The process indeed enables people transformation, promoting individual behavioural change for sustainable development, equality and respect for human rights and the planet's health. Through the process, people can develop their cognitive and non-cognitive skills, such as critical thinking and competencies for collaboration, problem solving, coping with complexity and risk, building resilience, thinking systemically and creatively, and empowering them to take responsible and regenerative action.

The choice of adopting a trasformative learning approach has been guided by the will of creating a creative process that enable a transformation of unsustainable mindsets and the adoption of a paradigm towards sustainability (Balsiger *et al*., 2017). As mentioned in chapter 2 of this book, transformative learning is the process of examining, questioning, validating, and revising our perceptions of the world, how we see ourselves and the world around us (Cranton, 1994; Merriam & Caffarella, 1999 as cited by Henderson, 2002). In the field of sustainability, transformative learning has gained increasing impetus and recognition and is considered critical to enhancing and catalysing social transformations towards sustainability (Boström *et al*., 2018). And so we assumed for regeneration.

The regenerative creative process is divided in three main stages: building commitment, designing the shift and embracing the shift. Each stage has a different objective with regards of regeneration and creative empowerment, and each one is divided in two steps (Fig. 6.1). Below each phase is explained, illustrating how the three aspects described above have been integrated.

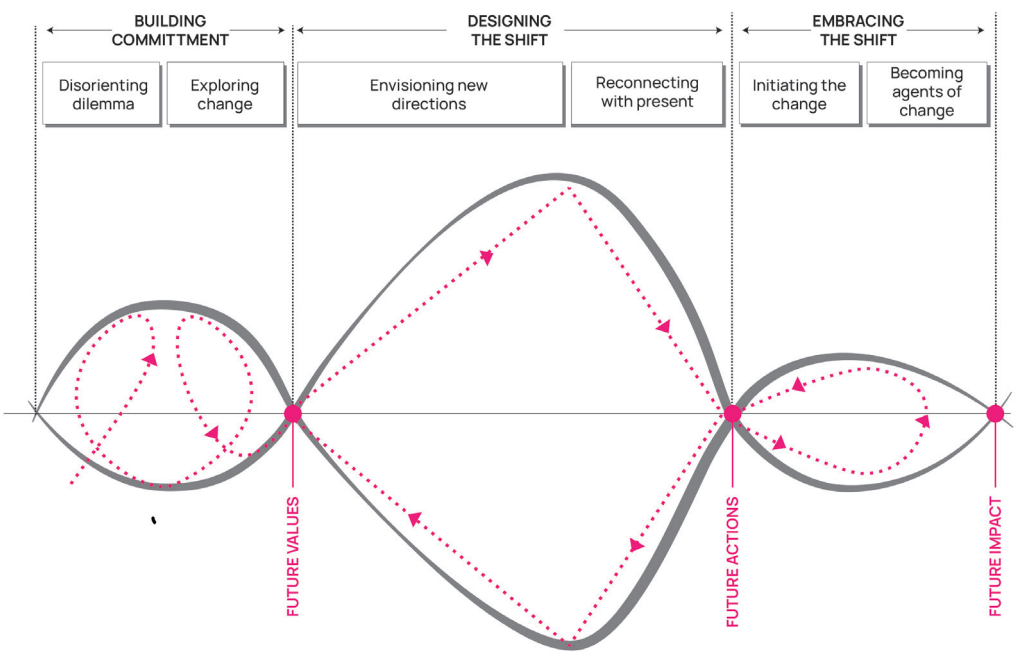

Figure 6.1. Visualization of the regenerative creative process, which constitutes the foundation of the ECODeCK model.

6.3.1 Building Commitment

The first stage of the regenerative creative process is Building Commitment. As the name suggests, its primary aim is to raise participants' awareness and foster a deep, personal commitment to adopting regenerative behaviours and mindsets. Crucially, this commitment must stem from an internal decision to engage – intellectually and emotionally – rather than from external pressures or directives (Amabile & Pratt, 2016). It is closely linked to intrinsic motivation, the internal drive that guides people's actions, behaviours and intentions based on their own personal beliefs and values or the ones of the community they are part of.

Therefore, this stage wants to stimulate people's 'inner dimension', which is a core element when envisioning and creating sustainable futures (Grenni *et al*., 2019; Landmann, 2020 as cited by Grund *et al*, 2023). Activating this dimension requires engaging both emotional and reflective capacities to enable a transformative shift in perspective. The process begins with a *Disorienting Experience*, which draws on Mezirow's concept of the *Disorienting Dilemma* from his Transformative Learning theory (Mezirow, 1991). In this step, it is fundamental to expose individuals to the realities of sustainability crises or allow them to experience unsustainable conditions firsthand. The intention is to provoke strong emotional reactions – both negative and positive – that can motivate collective action and environmental responsibility (Agostini & van Zomeren, 2021; Landmann & Rohmann, 2020, as cited by Grund *et al*., 2023). Through emotional engagement, in this step, people confront and self-assess their current individual values, opening space for deep critical reflection and inner questioning. Following this, the process moves to a second step of *Exploring Change*, where, through social dialogue, the exchange of ideas and experiences, and collaborative reflection, people can build and choose new sustainable and regenerative values that can drive future creative actions. Besides transforming existing value systems, this step also helps individuals build a renewed personal perspective towards sustainability and regeneration. Unlike the traditional creative process, which starts by analysing and exploring a given problem, searching for information to redefine it (Sawyer, 2012), a regenerative creative process begins by disrupting people's existing system of values in order to rebuild them

around regenerative and sustainable principles, driving decisions and creative actions in the future. The Building Commitment phase creates the conditions for nurturing regenerative values as a foundational component of regenerative creativity. This stage, therefore, fosters the nurturing and acquisition of regenerative values, ensuring that innovation emerges from a value-driven foundation, instead of being shaped by market needs and logics.

Thus, designing activities that support this stage requires careful attention to a few essential elements. First, it is important to work on *identifying regenerative values*. Within the ECODeCK project, for example, two core value pillars were drawn from the ST Comp (Bruno *et al*., 2025): *Supporting fair and ethical practices*, which help individuals take actions that preserve ecosystems and natural resources; and *Embracing environmental stewardship*, which calls for a recognition of humanity's interdependence with nature and a commitment to restoring resilient ecosystems and respecting the rights of all species. Second, it is critical to *design immersive and participatory activities* that engage participants emotionally and imaginatively. Creating fictional worlds with alternative rules through storytelling, role play, and worldbuilding methods can help participants access deeper layers of self-awareness and creativity. These experiences enable them to explore unfamiliar mindsets and experiment with new behaviours in a safe and generative environment. Lastly, *fostering co-design practices that incorporate diverse forms of knowledge* is vital. This means structuring learning environments that alternate between individual and collaborative reflection, aligning with the principles of transformative learning. Encouraging the participation of individuals with different perspectives and expertise broadens understanding of complex issues, such as climate change or unsustainable behaviours, and fosters the creation of a collaborative system of values as well as collaborative commitment. It is essential to ensure that these environments are safe, respectful, and supportive so that every participant feels comfortable contributing to the shared process.

6.3.2 Designing the Shift

The second stage of a regenerative creative process is Designing the Shift, building on the transformative learning process. Indeed,

Mezirow's process foresees that after a disorienting and critical reflection phase, individuals are ready to take concrete actions to make a change. Based on it, this stage empowers individuals to take concrete actions by designing new plans grounded in the regenerative values developed during the previous stage (Rodriguez Aboytes & Barth, 2020). It support a shift from reflection to regeneration through applied creativity. As a design-oriented process, Designing the Shift activates future-oriented imagination as well as a systemic, multispecies perspective, core elements of regenerative creativity. This stage guides people in designing preferred regenerative futures and in constructing feasible pathways for achieving them. This is accomplished through iterative cycles of divergent and convergent thinking (Tassoul & Buijs, 2007), which allow for broad exploration of possibilities followed by the focused refinement of concrete actions. The adoption of a design futures approach enables participants not only to imagine and co-create alternative scenarios but also to define structured roadmaps toward systemic transformation. The first divergent step, *Envisioning new directions*, supports participants in exploring a wide landscape of future possibilities. Through the analysis of social, technological, economic, environmental, and political trends and signals, individuals and groups can identify emerging patterns and construct speculative maps of potential futures. This process creates the conditions for deep immersion in imagining and co-designing alternative, desirable futures that are aligned with the regenerative values developed during the Building Commitment stage. Participants are encouraged to think beyond conventional paradigms and to embrace systemic perspectives that prioritise the health of both human and ecological systems. The second step, *Riconnecting with the present*, aims to translate envisioned futures into actionable strategies. This convergent phase supports individuals in exploring new behaviours, actions and roles while acquiring the competencies and knowledge necessary to act responsibly. It involves defining a clear and actionable roadmap – structured in progressive steps – through which the envisioned shift can be pursued. This step anchors future aspirations in present realities, providing a pragmatic bridge between imagination and implementationThis stage enable people to gain personal creative confidence and to develop design, managerial and strategic

skills which increases their sense of agency and empowerment with regard to regenerative transformation. This could lead people to express willingness to make a change in their communities, promoting sustainable actions (Iliško, 2007; Bell *et al*., 2016; Piasentin & Roberts, 2017; Probst *et al*., 2019 as cited by Rodriguez Aboytes & Barth, 2020), expressing feelings of responsibility towards climate change (Bentz and O'Brien, 2019 as cited by Rodriguez Aboytes & Barth, 2020), By going through the process of designing regenerative future, people begin to cultivate critical, systems, and complex thinking, allowing them to perceive the interconnectedness of cultural, social, economic, and environmental systems (Kostoulas-Makrakis, 2010; Kalsoom & Khanam, 2017 as cited by Rodriguez Aboytes & Barth, 2020). These capabilities are essential for understanding the interdisciplinary nature of sustainability challenges (Piasentin & Roberts, 2017) and for engaging with them in an informed and creative way

Designing activities that support this stage requires careful attention to a few essential elements. First, is fundamental to *envision scenarios with both people and planet at the centre*. Scenario building activities should be designed to expand people's focus beyond human needs, prompting them to consider the rights, needs, and roles of other species as well. The interdependence of all life forms and the health of ecosystems must be recognised as central to regenerative futures. This perspective fosters an ethical and relational understanding of design, grounded in the co-flourishing of people and the planet.

Second, is important to *work on real world challenges*. Grounding the creative process in actual problems enhances relevance, motivation, and engagement. Activities should involve real stakeholders and actors of the ecological system which are affected by the issue, enabling people to work with concrete constraints, perspectives and system relationships and dynamics. This connection with reality helps ensure that imagined futures are both visionary and context-sensitive. Lastly, regeneration is inherently place-based and requires *acting locally*. Activities should guide participants in analysing the complexity of local systems – both biotic and cultural – as part of a broader transformation process. Understanding the *master pattern* of a place helps identify key leverage points where small, strategic interventions can catalyse meaningful and lasting change. Developing

mental maps of these dynamics supports contextually grounded and health-generating design practices (Reed, 2007).

6.3.3 Embracing the Shift

The third and final stage of the regenerative creative process is Embracing the Shift. This stage is dedicated to integrating the designed change into the specific context, establishing new relationships with all the relevant stakeholders, and activating the envisioned solution. Through iterative cycles of learning and validation of the solution and feedback collection, the idea is validated by all the stakeholders involved. In this stage ideas are tested, adapted and implemented through iterative cycles of learning, reflection and validation. This iterative cycle of feedback involves different types of stakeholders and it becomes a conscious process of learning and participation through action, reflection and dialogue. Solutions are tested in context, their feasibility and resonance evaluated, and revised in response to real-world challenges and insights.

The first key step, *Initiating the Change*, revolves around the collaborative validation of the proposed solution. This involves understanding its *impacts across multiple levels* – on people, on organisations, and on the local ecosystem, including multispecies stakeholders. It requires assessing not only the functional effectiveness of the solution but also its *ethical implications*, long-term benefits, and its ability to reflect and reinforce the *regenerative values* established during the initial stages of the process. This step helps identify which new, sustainable, and regenerative behaviours the solution might activate, and how these can become embedded in daily practices.

The second step, *Becoming Agents of Change*, focuses on building *confidence and capacity* to embody the new roles and relationships required for regeneration. Through reflection and experiential learning, individuals begin to internalise the values and behaviours fostered throughout the process. This includes not only their application in professional or organisational settings but also their integration into personal life and worldview that shape their creative mindset. Participants develop a clearer sense of their *agency*, expanding their identity as regenerative designers and changemakers and cultivating the commitment and resilience needed to sustain the transformation over time.

Designing activities that support this stage requires careful attention to a few essential elements:

Firstly, *developing tangible prototypes and artefacts*, is an essential aspect of initiating the change. These material outputs serve as concrete expressions of the envisioned future, helping to visualise strategies and solutions in ways that are both actionable and collectively understood by all the stakeholders involved. Prototypes not only support iteration and validation but also serve as tools for alignment, enabling stakeholders to imagine and commit to the future collaboratively.

Secondly, it is crucial to *create spaces for deep personal and collective reflection*, encouraging participants to critically examine their own values, motivations, and behaviours in relation to the broader system. Activities should invite questions such as: What new practices have emerged? What behaviours have changed or been challenged? How do these shifts affect others – both within the organisation and the wider community? This fosters a heightened awareness of the interconnectedness of individual and collective transformation.

Lastly, activities should guide participants to *consider the impacts on the ecosystem* and the broader ecological implications of the change. This includes exploring how the proposed solutions influence not only human stakeholders but also non-human agents within the ecosystem. Participants should assess how newly adopted behaviours might contribute to the *amplification of regenerative practices*, encouraging their diffusion across contexts and communities. This perspective nurtures a deeper ecological consciousness and reinforces the systemic nature of regeneration.

6.4 Conclusion

Regenerative creativity invites us to rethink not only what we create, but how and why we create. It calls for a deep transformation in the way we imagine the future, understand our place within ecosystems, and cultivate values that sustain life. Throughout this chapter, we have explored regenerative creativity as a multidimensional and relational process – one that demands both cognitive and emotional

shifts, and that positions creativity as a means to generate systemic, ethical, and ecological value.

At its core, regenerative creativity is shaped by three interdependent components. First, it requires a *future-oriented imagination* capable of navigating uncertainty and embracing complexity. By envisioning alternative futures and expanding the horizon of possibility, individuals and organizations can cultivate the mindset necessary to innovate beyond present constraints. Second, it embraces a *systemic, more-than-human perspective*, acknowledging that creativity is not the sole domain of humans but emerges from entanglements with living systems, materials, and environments. This expanded view fosters greater accountability and responsiveness to the non-human world. Finally, regenerative creativity rests upon the *nurturing of values* such as empathy, care, integrity, and purpose. These values guide not only creative outcomes but the intentions and relationships that underpin them.

To operationalize these principles, the chapter introduced a three-stage regenerative creative process – *Building Commitment, Designing the Shift, and Embracing the Shift*. These stages form an actionable framework to foster reflective learning, shared visioning, and collaborative change-making. The process is inherently iterative and participatory, promoting agency, co-creation, and the embodiment of regenerative practices within real-world contexts.

This framework is not purely theoretical; it emerges from and is embodied in the *ECODeCK model*, a structured approach developed within the manufacturing field, specifically in the fashion and furniture sectors. ECODeCK applies the regenerative creative process through its training model, offering context-specific tools, content, and activities that immerse participants in emotionally resonant learning experiences. These experiences activate both cognitive understanding and affective engagement, thereby amplifying the impact of the training.

ECODeCK's approach demonstrates that regenerative creativity can be meaningfully adapted to professional environments, where it supports the development of competences, relationships, and innovations aligned with sustainability goals. By offering methods that are applicable within working contexts and promoting collective reflection, ECODeCK fosters diverse perspectives and strengthens the capacity for shared transformation.

However, this process is not limited to one sector. The regenerative creative process – while exemplified through ECODeCK – can be reinterpreted and customized across domains. It offers valuable guidance to *design educators* who aim to prepare future professionals capable of leading systemic and ethical transformation. For such adaptation to be effective, facilitators must anchor the process in the specific conditions, needs, and purposes of their context.

Ultimately, regenerative creativity is not a linear methodology, but a *living, evolving practice* – one that invites ongoing dialogue, experimentation, and care. It encourages us to ask not only what kind of futures we are designing, but also what kind of designers we are becoming. In cultivating this awareness, we shift from isolated creators to relational agents of change, capable of contributing to more just, resilient, and life-affirming futures.

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7. Designing Organisational Culture for Sustainable Transition

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7.1 Introduction

Sustainable transformation in organisations is not just about new technologies or operational efficiencies but about people. Culture shapes how organisations function, and design can be a powerful activator of change. We can empower individuals, influence behaviours, and seed a sustainable mindset by embedding design practices into corporate environments. This chapter explores how strategic design interventions can shift organisational culture, creating the conditions for sustainability to thrive not as a top-down mandate but as a people-centred evolution. Organisations can't change through rigid plans, analytics or hierarchical commands alone: transformation happens when people engage in genuine human-to-human dialogue (Verganti, 2024). How can strategic design foster these conversations in order to connect with the structural changes of the organisations?

Building on this foundation, we propose that activating a design intervention grounded in the nurturing of people is a powerful way to create the conditions for meaningful, long-term change toward

sustainability. This approach highlights one of the key contributions of design to complex processes of transformation: its capacity to operate not only through tangible outputs but through cultural and relational processes. In the context of sustainable transition, change must extend beyond strategy and structure; it must touch the *soft* and human side of organisations. Design has the potential to address this dimension by complementing traditional change management approaches, which often focus on formal structures, procedures, and performance metrics. Why design? Because design is more than a practice: it's also a cognitive model. It is a way of thinking and doing that invites curiosity, iteration, empathy, and systems awareness. When implemented within corporate environments, it can seed a design culture that becomes an internal force for behavioural and cultural change. Such culture is not enforced but grown, emerging through cross-level interactions, from individual mindsets and behaviours to collective narratives and organisational identity. Sustainable transition implies a cultural shift. This chapter reflects on how design can play a role in cultivating and accelerating this shift. How can design help organisations move from a logic of control and compliance to one of meaning and participation? By blending human-centred practices with systemic change perspectives, design has the unique potential to align structural transformation with the lived experience of people inside the organisation. The Ecodeck project, with its research through design initiative within the Italian furniture industry, explores these questions in a real-world context. This project also serves as a case study to examine how design can operate at the intersection of individual engagement, organisational change, and sectoral transformation, offering valuable insights into the practical and cultural dimensions of sustainability in action.

7.2 Organisational Cultures Transformation

To understand the role of design in sustainable transitions, we must look beyond structural interventions and into the deeper terrain of cultural change. Structural change refers to the reconfiguration of processes, hierarchies, and systems within an organisation, changes

that are often planned, measurable, and managed through traditional models of change management. Cultural change, by contrast, deals with the more elusive yet equally powerful layer of shared values, beliefs, assumptions, and behaviours that govern how people act and interact within the organisation. As Edgar Schein (Schein, 1985) famously argued, culture is not just an aspect of the organisation – it *is* the organisation. According to Schein's influential model, organisational culture exists across three interdependent levels: artefacts (the visible and tangible), espoused values (the strategic and declared), and basic underlying assumptions (the subconscious drivers of behaviour). It is in these layers that we can begin to explore how design, and more specifically design culture, can intervene. Organisational culture is not monolithic; as Sapelli (Sapelli, 1988) and Zurlo (Zurlo, 2019) emphasise, it is a constellation of co-existing cultures – economic, organisational, technological – that must coexist and negotiate meaning within the corporate environment. Design culture, in this sense, is not an external force but a catalytic subculture that serves the broader mission of corporate transformation.

Can we assume that it exists also a *sustainability culture* within the set of corporate cultures? If we look beneath the surface, into Schein's third level of underlying assumptions, we often find tacit beliefs about growth, resource use, and human relationships to the environment that are rarely challenged. Cultivating a sustainability culture, therefore, means reshaping these assumptions: shifting organisational mindsets from extraction to regeneration, from short-term efficiency to long-term impact.

This research framework offers a powerful lens to examine how sustainability may not merely be implemented as a strategy but internalised as a belief system. The integration of a sustainability organisational culture depends precisely on this deep embedding of values and assumptions, not just procedural or symbolic changes. According to Assoratgoon and Kantabutra (Assoratgoon & Kantabutra, 2023), the field has long emphasised sustainability at the artefact level, such as green offices, eco-certifications, and CSR reports; while the level of basic assumptions has remained understudied and underutilised, despite being fundamental for driving long-term transformation. In Schein's terms, organisational culture operates as a social control

mechanism that channels behaviour through shared beliefs and invisible assumptions. These assumptions, which shape "how we do things around here," are exactly where sustainability culture must take root. A sustainability organisational culture can be defined as a set of shared assumptions, values, and beliefs about sustainability that manifest in an organisation's decision-making and practices (Ketprapakorn & Kantabutra, 2022). This cultural embedding is essential, as merely aligning surface-level behaviours (like recycling policies or carbon tracking) without addressing the normative foundations (e.g., beliefs about growth, ethics, responsibility) often leads to performative sustainability. Design can act as a lever to access and reshape these deep cultural layers. The process of embedding design culture into organisations requires not just structured interventions but ongoing acts of creative disruption: a form of *creative distress* that destabilises the status quo and opens up spaces for alternative futures (Melazzini *et al*., 2023; Zurlo, 2019). Through visible elements such as space, symbols, and service experiences, design can influence the artifact level. Through storytelling, vision design, and participatory engagement, it can affect espoused values. But its most transformative potential lies in the cultivation of new assumptions: in creating opportunities *for employees to experience, reflect upon, and internalize new ways of thinking about sustainability, value, and purpose. Thus, design does not merely serve the broader corporate culture; it actively co-constructs it*. In this light, the introduction of a design culture becomes a strategic act of *cultural prototyping*: testing, iterating, and seeding new cultural codes that align with sustainability principles. As shown in the sustainability cultural transformation frameworks discussed by Assoratgoon & Kantabutra (Assoratgoon & Kantabutra, 2023), the move toward a sustainability organisational culture involves more than technical solutions: it demands normative grounding, attention to identity formation, and a rethinking of what success means within the organisation. Design, with its capacity to operate across tangible and intangible dimensions, emerges as an ally in this transformation. In this way, design could support organisations not only in transforming what they do, but also who they are.

7.3 Design and Organisational Change

Cultural change in management theory has long been recognised as one of the most complex and deeply embedded challenges within organisations. Scholars such as Alvesson and Sveningsson (Alvesson & Sveningsson, 2015) describe cultural change as a *work in progress*, involving slow, nonlinear processes that depend heavily on contextual, political, and emotional dynamics within the organisation. Meyerson and Martin's (Meyerson & Martin, 1987) seminal work adds a useful framework by synthesising three dominant perspectives on cultural change: the integration view (culture as shared), the differentiation view (culture as contested), and the fragmentation view (culture as inherently ambiguous). These theories highlight the layered and sometimes contradictory nature of organisational culture, setting the stage for why traditional managerial approaches often struggle to engineer meaningful cultural transformations.

It is precisely in these kinds of conditions that design enters as a transformative force. The emerging relationship between design and management offers not just a toolkit for solving problems but a new paradigm for reforming organisational culture (Buchanan, 2015). Unlike traditional management approaches, which often focus on optimisation and control, design focuses on synthesis, systems thinking, and the quality of experience as a central metric of success. Buchanan positions design as a cultural act: a way of imagining and shaping the values, symbols, behaviours, and spaces that constitute the lived culture of an organisation. Importantly, this perspective sees decision makers not merely as administrators or strategists, but as designers of the environments that shape how individuals work, interact, and grow. As such, design is not a surface intervention but a driver of deep cultural reform. To understand how design catalyses cultural change, it is helpful to consider the organisational behaviour framework through its three levels: micro (individual), meso (group), and macro (organisational). In recent years, the field of organisational behaviour has increasingly emphasised the importance of the micro-level – individuals – as agents of transformation (Miner, 2006; Wagner & Hollenbeck, 2014). Micro-organisational behaviour research sheds light on how individual traits and practices, such as

decision-making, creativity, stress management, and job performance, can ripple outward to shape broader organisational outcomes (Cummings, 1978). These dimensions are also key concerns in design management, where the goal is often to empower individuals as active participants in change processes rather than passive recipients of policy. Recognising employees as the starting point for cultural change allows design to serve not only as a cognitive model but as a participatory process rooted in everyday work life. Design-led interventions such as prototyping, co-creation, and scenario building can trigger micro-level transformations that, when supported structurally, scale to affect the meso and macro dimensions of culture. In this way, design doesn't impose cultural change: it enables it by fostering the trust, creativity, and shared purpose that can reconfigure an organisation's internal logics from the bottom up.

7.4 Design *Sustainable-Based* Interventions

Having explored the conceptual foundations linking design, organisational behaviour, and culture, this chapter now turns to practice. How can design concretely initiate cultural change in organisations committed to sustainable transitions? A possible answer lies in what we term design interventions: intentional, structured engagements through which design operates not only at the level of individual behaviours (micro), but also across group dynamics (meso) and institutional systems (macro). These interventions span both intangible elements (values, mindsets, competencies) and tangible aspects (spaces, routines, communication touchpoints) of corporate culture, offering a holistic framework to initiate and support cultural transformation. We distinguish two core typologies of design interventions: the first relates to nurturing design culture through capability building, the other instead addresses designing conditions for experiential engagement. Each type corresponds to distinct yet complementary dimensions of cultural change and leverages the power of design to reframe how individuals and organisations evolve.

7.4.1 Practising Design Culture: nurturing creative competencies

From a design perspective, the most fertile entry point for transformation lies at the micro-level: the individual employee. Employees are not passive recipients of organisational norms but active agents capable of reshaping them, provided they are equipped with the right tools and mindset. One key enabler in this context is *creative confidence* (Kelley *et al*., 2013), which refers to the belief that everyone is capable of creative contribution. But this is not merely a matter of confidence it involves the development of specific design-based competencies: empathy, abductive reasoning, systems thinking, iteration, and co-creation. Design interventions of this type often take the form of capacity-building activities, such as workshops, labs, and immersive learning experiences, that foster both individual empowerment and cultural alignment. Such interventions aim to seed new ways of thinking about challenges such as sustainability, resilience, and innovation. Adopting creative confidence can be a transformative experience: it enables individuals to approach problems with fresh eyes, take meaningful risks, and propose unconventional yet effective solutions. In turn, these individual shifts in perspective influence collective behaviours, reinforcing a broader evolution of culture. The challenge, however, lies in designing intangible pathways that go beyond skills training to cultivate a sustained cultural disposition. This requires thoughtful scaffolding of experiences that instil not just tools, but a new lens through which employees understand their work, their role, and their contribution to a sustainable future. As employees grow in creative autonomy, their influence on team dynamics and organisational strategies grows as well, scaling cultural change from the micro to the meso and macro levels.

7.4.2 Designing the Conditions: Activating Culture Through Experience

Complementing this internal shift in mindset is the need to design the conditions that allow new behaviors to emerge and flourish. This second typology of intervention addresses the tangible aspects of culture: how employees physically and socially engage with their work environment, and how these engagements are structured and reinforced. Here, the focus shifts from internal capabilities to ex-

ternal experience design, a domain increasingly recognized at the intersection of Design and Human Resource transformation (Rossi, 2021; Batat, 2022). Drawing from insights in employee experience design (Maylett & Wride, 2017; Morgan, 2017), this intervention type involves rethinking the everyday realities of work: spaces, tools, rituals, interactions, and symbols that encode corporate culture. Design can shape physical environments that signal openness and sustainability, craft service journeys that reflect values, and prototype new routines that model the behaviors a company wants to cultivate. As Lesser (2016) outlines, employee experience spans three spheres: the physical environment, social connections, and task engagement, all of which can be intentionally redesigned to reflect and support a cultural shift. Designers in this space act not only as facilitators but as organizational scenographers, staging experiences that align the employee's journey with the company's transformation agenda. Whether reimagining onboarding processes, reframing work rituals, or reconfiguring collaborative spaces, the goal is to activate culture through experience – not through mandates or memos, but through meaningful, embodied engagement.

Design interventions, both intangible and tangible, represent more than tactical solutions. They are *strategic vehicles for cultural evolution*. When deployed thoughtfully, they create enabling environments that nudge people toward new ways of thinking, working, and relating. The power of design lies not in prescribing change but in inviting exploration, enabling participation, and provoking reflection. By offering experiences instead of edicts, options instead of orders, design makes room for *interpretation and ownership*, two essential conditions for any authentic cultural shift. Furthermore, the gradual, participatory nature of design interventions helps overcome resistance, fostering trust and openness even in organisations historically sceptical of change. Ultimately, these interventions aim to embed new assumptions into the fabric of organisational life, assumptions that support not only business goals but societal ones. Through design interventions, a process of transition can be activated.

7.5 Ecodeck: a Design Intervention to Cultivate Sustainable Culture

Design has the unique capacity to align systemic organisational transformation with the lived, human experiences of the people who inhabit institutions. As we have explored in this chapter, the power of design lies not merely in optimising operations or innovating products, but in shaping and nurturing culture, constructing new assumptions, behaviours, and meanings that reflect a more sustainable way of organising. By operating across micro, meso, and macro levels of organisational life, design interventions can seed and scale shifts in mindset, action, and strategic orientation. Design's transformative potential resides in its ability to work both within and beyond formal structures. Design interventions engage individuals in experiences that invite reflection, experimentation, and ownership of new practices and values. They activate what Edgar Schein would describe as a reconfiguration of *underlying assumptions*, subtly reshaping what is considered meaningful, desirable, and possible within the organisation. In this light, design culture becomes a strategic tool, a *cultural prototyping device*, through which the DNA of the organisation evolves in support of sustainability.

The ECODeCK project serves as a compelling case study to ground these concepts in practice. Developed within the Italian manufacturing sector, particularly the fashion and furniture industries, ECODeCK explores how design-led training can catalyse sustainable transition through human-centred, culturally sensitive methods. The project's core contribution lies in a design-based educational model, grounded in *Transformative Learning Theory* (Mezirow, 2003; Taylor, 2000), that equips employees at all levels with the capacity to think critically, engage ethically, and act creatively within their roles. Through a dedicated capacity-building model, ECODeCK offers an actionable pathway to cultural renewal. The project's competence framework provides a structured foundation for employees to integrate sustainable values into daily practices, transforming abstract ethical principles into concrete, innovative behaviours. This human-centred process becomes a lever for broader organisational

and sectoral evolution. At the same time, ECODeCK operates within a context of real challenges, particularly within the Italian furniture industry. As noted by Musso *et al.* (2024), many companies in this sector face cultural resistance, characterised by legacy mindsets, inertia, and fragmentation between product innovation and systemic sustainability. Despite the strong role of design in product development, circular economy practices remain marginal, with reuse and regeneration often secondary to recycling or disposal (Ghisellini & Ulgiati, 2020). Moreover, firms show a significant gap in organisational readiness, with limited integration of sustainability principles into their business models or employee training (Tessitore *et al*., 2025). ECODeCK navigates this tension by working from the inside out, not imposing solutions but instead co-constructing meaning and practice through participatory training, co-design, and experiential learning. It recognises that changing corporate culture is not about replacing one system with another, but about inviting new conversations, new interpretations, and ultimately, new ways of being within organisations. In doing so, it validates the premise that design is not merely a support function: it is a strategic actor in cultural and sustainable transformation.

This chapter has argued that nudging sustainable transformation in organizations must start from the human side. It must begin with individuals, with the relationships they form, the values they share, and the environments they help co-create. Design interventions are powerful precisely because they do not demand immediate compliance: they create space for emergence, for slow shifts in perspective, practice, and identity. Rather than enforcing change, design invites it. It enables individuals to see themselves not just as employees or managers, but as co-authors of a shared future.

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8. Designing Circular Manufacturing for Sustainable Transition: The Case of Fashion

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8.1 Introduction: No More New Clothes!

The world is currently facing an unparalleled environmental crisis, with consequences that are already reshaping the natural world and human societies alike. Climate change, deforestation, biodiversity loss, and the rapid depletion of essential resources are among the major challenges that pose serious risks to the sustainability of human societies (Ferrella *et al*., 2021). These changes, often characterized by their non-linear, accelerating nature, have far-reaching consequences, including extreme weather events, natural disasters, and mass migrations, creating a complex web of challenges for both humanity and the environment. Within this context, the fashion industry – one of the most impactful and resource-intensive sectors among manufacturing industries – stands out as a critical area for intervention. This work purposely focuses on fashion, not by coincidence, but by design: the choice reflects the urgent need to address the disproportionate environmental and social impacts generated by this sector. From resource depletion to social injustices, the industry's environmental

footprint is immense, and its traditional manufacturing processes – based on the linear *take-make-dispose* model – are contributing to a system of unsustainable growth (Niinimaki *et al*., 2020). Concentrating efforts on fashion allows for targeted, high-impact actions aimed at fostering systemic change where it is most needed.

In light of the significant ecological and social challenges posed by fashion, it is evident that the industry must undergo a profound transformation (Bertola & Colombi, 2024). However, the need for change extends far beyond industry practices alone. *At the heart of this transformation lies education, which plays an indispensable role in reshaping the future of fashion. Education is not just about teaching sustainable practices but also about fostering a fundamental shift in mindset – a change in how we understand and engage with the fashion industry, its impact, and its potential for positive transformation (Leal Filho* et al.*, 2018)*.

Fashion's traditional model is deeply rooted in a cycle of overconsumption, waste, and exploitation, relying on cheap materials, toxic dyes, and exploitative labor to produce garments that are discarded after only a brief period of use. The unsustainable consumption of resources, coupled with the tremendous waste generated by the fashion industry, exacerbates environmental destruction (Pal & Gander, 2018). Millions of tons of clothing are discarded each year, contributing to landfills and incinerators, while textile production remains one of the largest contributors to global carbon emissions. The environmental toll of fashion is not limited to its carbon footprint – water consumption, toxic pollution, and deforestation are just a few of the areas where the industry's impact is felt most acutely.

The environmental footprint of fashion is staggering, encompassing pollution, resource depletion, and vast amounts of waste. Textile production alone is responsible for large-scale carbon emissions, with the industry accounting for approximately 10% of global carbon dioxide emissions (Farhana *et al*., 2022). The extensive use of water in garment production also raises concerns, with the fashion industry consuming more water than many countries. Additionally, the disposal of garments – especially fast fashion items – has led to millions of tons of textile waste each year, contributing significantly to overflowing landfills (Niinimaki *et al*., 2020). The linear *take-make-dispose* model

prevalent in fashion exacerbates these problems, pushing the need for alternative production systems and a reevaluation of the industry's impact (Lång & Hörndahl, 2023).

The global textile industry produces 92 million tons of waste annually, much of which is non-biodegradable (Sing *et al*., 2025). For instance, in the United States alone, more than 11 million tons of textiles end up in landfills every year (Textiles: Material-Specific Data | US EPA, 2024). The carbon footprint of fashion is also alarming, with a single garment often requiring vast amounts of energy, water, and chemicals in production. Fast fashion exacerbates these issues by encouragin overconsumption and short product lifecycles, leading to even more waste and environmental damage (Niinimaki *et al*., 2020).

Beyond its environmental effects, the fashion industry is inextricably linked to social injustices. Workers in the global supply chains of fast fashion are often subjected to poor wages, unsafe working conditions, and human rights violations (von Busch, 2022). Fashion's supply chain often involves labor exploitation, with workers in developing countries facing poor working conditions, unsafe environments, and insufficient wages. These injustices are an inherent part of the industry's drive for profit at the expense of both human dignity and environmental health (Nolan, 2022). These issues are compounded by the relentless demand for low-cost production in countries with minimal labor protections, creating a vicious cycle of exploitation. As the demand for cheap, fast fashion continues to rise, these inequities deepen, and the gap between the privileged and the disenfranchised grows wider (Battisti & Spennato, 2024). *No More New Clothes!* is not merely a statement but a call to rethink fashion's manufacturing model in response to these global challenges, urging a fundamental shift towards ethical production, fair labor practices, and a more sustainable and equitable system for all. The urgency of addressing these issues is magnified by the interconnected crises we face. The global response to the Covid-19 pandemic has exposed the fragility of existing systems and underscored the need for industries – particularly fashion – to rethink their practices. The pandemic revealed systemic inequalities and vulnerabilities, reinforcing the necessity of moving away from the traditional linear economic models that contribute to environmental destruction and exploitation (Moosavi

et al., 2022). The fashion industry is at a crossroads, where the need for radical change has never been more pressing. This transformation must center on sustainability, social justice, and ethical production – principles that are inherently incompatible with the current model. To achieve this, the fashion industry must embrace circularity, a shift from wasteful, linear processes to those that prioritize resource efficiency, sustainability, and the well-being of workers (Gautam, 2024).

For a radical transformation of the fashion industry to take place, education must serve as a foundational catalyst. It plays a crucial role in transmitting the knowledge, competencies, and mindsets required to drive meaningful and enduring change. Universities, design schools, and other educational institutions are uniquely positioned to lead this transition by reconfiguring their curricula to prioritize sustainability, circular design principles, and ethical practices. At present, fashion education remains largely grounded in traditional production methods and aesthetic conventions. This model must be reimagined to encompass a holistic understanding of the environmental, social, and ethical implications of design and manufacturing (Dutt & Gandhi, 2024). As Sterling (2014) underscore, the field must shift from an anthropocentric perspective to a systemic one, embedding ecological literacy and socio-environmental responsibility as core pedagogical values. This transformation necessitates not only technical instruction but also the development of critical thinking skills that empower students to challenge dominant paradigms and envision regenerative alternatives (Howlett *et al*., 2016). *Within this framework, design must be redefined as a transformative act – one that transcends aesthetics to function as a catalyst for social and ecological renewal. To facilitate this paradigm shift, higher education institutions must evolve into dynamic learning ecosystems capable of responding to the complex and interdependent challenges of our time*. Embedding sustainability across all facets of the curriculum – from design thinking and material innovation to supply chain ethics and strategic management – is imperative. As D'Itria and Vacca (2020) point out, this demands transdisciplinary approaches, participatory pedagogy, and a focus on systems thinking to equip emerging professionals with the tools needed to create a more just and sustainable fashion system. In this way, fashion education can become a powerful lever for system-

ic change, cultivating a new generation of practitioners who center sustainability, circularity, and social equity – not as peripheral considerations, but as integral dimensions of their creative and professional ethos (Williams, 2019).

In light of the presented scenario, the chapter explores three interrelated dimensions of change: (I) *Redesigning Fashion* investigates the regenerative potential of design, moving beyond extractive and linear models; (II) *From Training to Transformation* emphasizes the role of education in shaping new narratives and practices, drawing on experiences such as the ECODeCK project; and (III) *The Path Forward* calls for shared responsibility and long-term visions grounded in care, equity, and sustainability. Rather than proposing quick fixes or superficial solutions, the chapter advocates for a cultural and systemic transformation of the fashion industry, driven by a fundamental rethinking of education.

8.2 Redesigning Fashion: From Environmental Crisis to Manufacturing Circularity and Sustainability

In the face of the environmental and social crises outlined previously, the fashion industry can no longer rely on isolated solutions or incremental improvements. A profound transformation is needed – one that rethinks the foundations of fashion itself. At the core of this systemic shift lies design, understood not merely as an aesthetic endeavor, but as a cultural, social, and interpretive practice. As a discipline, design plays a crucial role in decoding contemporary cultures and re-signifying them through artefacts – both tangible and intangible – that respond meaningfully to the evolving needs and values of society (Bertola *et al*., 2016). Design in this broader sense becomes an active agent of cultural innovation, capable of interpreting societal change and shaping new symbolic universes. In fashion – a paradigmatic example of a culture-intensive industry – design operates as a vehicle of identity construction, storytelling, and authenticity (Bertola & Colombi, 2024). It embeds cultural contents into garments,

turning them into tools of mediation between individuals and their environments, and transforming the traditional producer-consumer relationship into a dynamic space of cultural exchange (Bertola *et al*., 2016; Sanches *et al*., 2015; Fiorani, 2006). However, this expansive role of design cannot unfold in a vacuum. Its transformative potential must be supported by policy frameworks, cultural shifts, and above all, a renewed educational ecosystem that fosters systemic thinking, ethical responsibility, and critical engagement with the social and environmental dimensions of fashion (D'Itria & Colombi, 2023). Within this context, sustainability becomes not just a technical issue, but a cultural and symbolic challenge. When design is grounded in sustainability principles, it enables a reconfiguration of the entire lifecycle of garments – from the sourcing of materials to their afterlife – integrating environmental and social considerations at every stage. Yet, several scholars (Press & Celi, 2024; D'Itria & Vacca, 2020; Williams, 2019; Howlett *et al*., 2015 Jones, 2015) highlight, unleashing this potential requires an educational infrastructure capable of preparing future designers to navigate and shape complex socio-technical systems. In tandem with educational reform, policy innovation is a necessary lever for transformation (Zhang *et al*., 2024). The European Union's Circular Economy Action Plan (https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en) and EU Textile Strategy (https://single-market-economy.ec.europa.eu/sectors/textiles-ecosystem/strategy-textiles_en) mark significant steps in reorienting fashion toward a circular model – one that privileges durability, reparability, and transparency over disposability and opacity. These strategies aim not only to reduce the environmental impact of the industry, but also to address the systemic injustices embedded in global supply chains (European Commission, 2019). At the core of emerging sustainability strategies lies the concept of circular fashion – a model aimed at closing production loops and reducing dependence on virgin resources (Kirchherr *et al*., 2017). While the potential of circularity is significant, critical scholars caution against the risk of it becoming a techno-managerial fix, co-opted to serve market interests without interrogating the deeper cultural, social, and structural foundations of the fashion system. When implemented superficially, circular models may inadvertently replicate the same exploitative dynamics of the

linear economy, albeit under the guise of sustainability. An expanding body of critical literature highlights the limitations and contradictions embedded within the prevailing discourse on circular fashion. They argue that central concepts within circular fashion often remain vague, inadequately grounded in economic theory, and biased in favor of dominant fashion brands. This tendency marginalizes the voices of consumers, workers, and communities most affected by fashion's systemic inequalities, and obscures the broader socio-economic and cultural dimensions of sustainability (Hussain *et al*., 2025). Importantly, this critique does not dismiss the value of circular fashion outright. Rather, it calls for a more critical, reflective, and context-sensitive approach – one that resists reducing circularity to a mere technical solution or branding strategy. A meaningful transition to circular systems must address structural inequalities, redefine notions of value beyond profitability, and ensure that emerging models do not perpetuate the very logics they seek to transform (Pla-Julián & Guevara, 2019). According the aforementioned, such a transformation demands embedding circularity within a more expansive paradigm shift – one that reimagines fashion and related sectors, such as the furniture one, not solely as economic domains, but as interwoven cultural ecosystems (Bertola & Colombi, 2024). Within this evolving framework, models like ECODeCK offer critical insight. Grounded in a three-level perspective of design for sustainability – product-centric, organization-centric, and ecosystem-centric – ECODeCK enables a nuanced understanding of how sustainable practices emerge, consolidate, and diffuse across different layers of production and interaction. By emphasizing the transition from isolated technical improvements to systemic, ecosystem-based innovation, Ecodeck illustrates how sustainability can be enacted holistically – addressing environmental, social, economic, and cultural dimensions concurrently (D'Itria *et al*., 2024). As an open, collaborative model, it positions design as a platform for co-creation, systemic awareness, and inclusive transformation – essential ingredients for fostering a truly just and regenerative future. In this vision, designers are not only creators of products, but also curators of meaning and agents of change (Press & Cooper, 2017). Their work shapes the way we dress, but also how we relate to the world and to one another (Marchetti, 2020; Fiorani, 2016;

Crane, 2000). To fully activate this role, design education must evolve – from teaching skills and trends to cultivating critical, reflective, and relational thinking (Patel *et al*., 2024; Guaman-Quintanilla *et al*., 2024; Noweski *et al*., 2012). The goal is to train professionals who can navigate complexity, challenge dominant narratives, and co-design futures that are ecologically responsible and culturally rich (Varanka, 2024).

The *European Green Deal* reinforces this reorientation by establishing measurable targets and promoting tools such as traceability, product labeling, and eco-design requirements. Yet, beyond metrics and compliance, the real challenge is to *sustain a cultural transformation* – one that repositions fashion as a space of collective imagination, responsibility, and renewal. In this context, *design emerges not just as a solution, but as a language* – a way of narrating and negotiating change, of rendering innovation meaningful (Nelson & Stolterman, 2014). As the fashion system moves toward circularity, its design practice must also move toward *sense-making*: creating artefacts and experiences that embody ethical, ecological, and cultural significance (Casciani, 2024; Moss, 2008). This expanded role of design places manufacturing at the center of the conversation and repositions the designer as a strategic orchestrator – one who navigates, connects, and directs actions across the entire value chain. In this context, the designer is not merely a creator of products but a systems thinker, capable of shaping the conditions under which materials are sourced, transformed, circulated, and revalued (D'Itria, 2025; Jones, 2014; Verganti, 2009). This shift calls for a profound rethinking of fashion education models. If design is to function as a catalyst for transformation within the manufacturing landscape, then the institutions and pedagogies that cultivate future practitioners must themselves be reimagined (Aithal & Maiya,2023). Only through a systemic overhaul of educational frameworks – anchored in cultural critique, critical making, and sustainability – can fashion design education empower designers to actively choreograph regenerative practices across industrial ecosystems, thereby positioning design as a driving force for both social and ecological renewal.

8.3 From Training to Transformation: Rethinking Fashion Education for Sustainability with ECODeCK Project

As previously discussed, education emerges as a powerful catalyst for systemic change. From university classrooms to professional development programs, the ways in which we teach and learn about fashion have the potential to radically reshape its future (Bertola & Colombi, 2021; Bertola, 2018). Education – formal, informal, and lifelong – plays a crucial role in fostering not only technical know-how but also critical, ethical, and systemic thinking. In a sector long dominated by speed, disposability, and extraction, this kind of transformative learning becomes essential. Yet this shift is not solely a technical challenge. It is a profound cultural and cognitive transformation. It requires rethinking how we design, produce, and consume – demanding new competencies, values, and critical capacities (Bertla & Colombi, 2021). This transformation cannot occur without a corresponding evolution in how people are trained and how their competencies and skills are nurtured. Traditional educational models often fall short, reinforcing linear production models and market-driven logics that leave emerging professionals ill-equipped to engage with or lead sustainable change. Scholars such as Bawden (2008) have critiqued educational paradigms that prioritize economic efficiency while neglecting ecological responsibility. In contrast, a new wave of educational initiatives is reorienting fashion pedagogy toward transformative learning – placing sustainability, systems thinking, and human development at its core (Williams *et al*., 2019). An example of such initiatives is provided by the ECODeCK project. Far from offering surface-level solutions or repackaging outdated models, ECODeCK is rooted in a transformative approach that reimagines sustainability as a design challenge, embedded in the core of how production systems operate, evolve, and generate value within planetary limits. Unlike many approaches still focused on compliance or efficiency tweaks, ECODeCK puts forward a radically different paradigm, where design is not merely an aesthetic tool, but a mechanism for systemic change. It is an intentional strategy to redesign processes, materials, and business models from the

ground up, in order to support circular flows, regenerative outcomes, and long-term resilience. In this light, ECODeCK is not simply about teaching sustainability – it's about cultivating the capacity to shape it through creative, anticipatory, and ethically grounded decision-making. At its foundation, the project signals a fundamental shift from conventional training models to an education that is deeply aligned with the realities and urgencies of today's manufacturing landscape. ECODeCK's design-led capacity-building approach offers more than new knowledge – it promotes a mindset shift. It prepares enterprises, especially SMEs, to anticipate shifts in markets, policy, and environmental pressures, and to respond dynamically through practices that are not only adaptive, but regenerative in nature. To achieve this, ECODeCK develops and promotes holistic competencies – defined as a blend of knowledge, skills, attitudes, and values that empower individuals to understand complex systems, make sound and ethical decisions, and act with purpose in uncertain environments. These competencies extend beyond technical expertise, combining systems thinking, critical reflection, intercultural collaboration, and a deep commitment to sustainability. In doing so, they prepare professionals to navigate the interconnected challenges of social, economic, and ecological transformation. A key objective of ECODeCK is to enhance the strategic agility of manufacturing firms, particularly SMEs, by embedding these holistic competencies into organizational cultures and operational routines. Strategic agility, in this context, is not just about flexibility – it's about the ability to align decision-making with broader sustainability goals, anticipate emerging trends, and foster innovation rooted in ethics and systems awareness. This is especially relevant as companies across Europe face growing pressure to align with the European Green Deal and broader circular economic ambitions. Central to the project are two instruments: the Design for Sustainability Framework and the Sustainable Transition Competence Framework (ST Comp) These tools do not offer prescriptive solutions, but rather support incremental, situated learning through applied research and collaborative intervention. The Design for Sustainability Framework maps how design can act as a catalyst for reorganizing production systems, enhancing innovation capacity, and enabling new forms of value creation that respect ecological and social boundaries. Sustain-

ability, in this view, is not an afterthought – it is integrated across every stage of production, from resource sourcing to product end-of-life. The ST Comp complements this by redefining what it means to be a sustainability-oriented professional in the manufacturing sectors. It articulates a sector-specific, operationally grounded understanding of the competencies needed to work within complex, ethically fraught, and fast-changing environments. More than implementation tools, these competencies enable individuals to question dominant growth models and imagine alternative futures centered on circularity, durability, and shared prosperity. What makes ECODeCK particularly distinct is its integration of learning and doing. The project positions sustainability as a creative and professional identity – something cultivated through practice, not imposed from the outside. Its educational tools and collaborative methods help bridge the gap between theoretical frameworks and day-to-day industrial reality. Through partnerships with universities, vocational training institutions, and industry stakeholders, ECODeCK ensures that its innovations are not only visionary, but also implementable at scale. The project's overarching ambition is to implement, validate, and scale an educational model that embeds sustainability thinking directly into the operational DNA of manufacturing firms. This includes the development of modular, adaptable learning pathways that can be integrated into ongoing professional development and workplace learning – pathways that support both individual agency and organizational transformation.

Ultimately, ECODeCK offers more than just a roadmap for sustainable manufacturing. It puts forward a call to action for the broader redefinition of professional practice in the age of climate urgency. It envisions a future where fashion and furniture design are no longer driven by linear growth imperatives, but by an ethic of responsibility, regeneration, and systemic care. It reframes education as a transformative force – not by teaching how to produce more, but by helping people learn how to design differently, act wisely, and produce within the limits of a shared planet. In this sense, real transformation begins not in the market, but in the way we learn to shape the systems that shape us. ECODeCK brings this insight to life – offering a concrete, collaborative, and creative model for designing circular manufacturing processes capable of sustaining both people and planet.

8.4 The Path Forward: A Critical Call to Action!

The contents of this chapter have led me to critically reflect on the current condition of the fashion industry and its complex implications for both the environment and society. It is increasingly evident that the existing model is unsustainable. The sector's high levels of carbon emissions, intensive water usage, and the growing volume of textile waste are not isolated problems, but indicators of a systemic logic based on overproduction, overconsumption, and extractive practices. These issues point to the need for a fundamental rethinking of how fashion is designed, produced, and consumed. Addressing such challenges requires the active engagement of multiple actors – designers, educators, and consumers alike – in shaping more responsible and context-sensitive approaches within the industry. Long guided by logics of novelty, disposability, and speed, the fashion industry finds itself at a critical juncture. Incremental improvements or isolated sustainability efforts are insufficient in addressing the structural issues embedded within the system. What is needed is a shift beyond the dominant linear *take-make-dispose* model, toward practices that foreground responsibility, durability, and care for both people and the planet. This transformation entails not only technical innovation but a broader reimagining of fashion's cultural, economic, and ecological dimensions. Central to this shift is the adoption of responsible production models – approaches that integrate environmental impact, ethical sourcing, and longevity into the design process. The objective is to create garments conceived not for short-term use, but with principles of durability, repairability, and circularity in mind. Such a model challenges the perception of clothing as disposable, positioning it instead as a long-term investment with material, social, and symbolic value. Yet production practices alone cannot drive the systemic changes that are needed. Education plays a pivotal role in cultivating the critical and ethical awareness required for such transformation. As it currently stands, fashion education continues to reinforce a market-oriented, fast-paced approach that prioritizes novelty over reflection. Many curricula still emphasize aesthetic experimentation and rapid production cycles, often without fully addressing the

broader environmental and social consequences of design decisions. There is a pressing need to reframe educational frameworks within the fashion domain. Institutions have the potential to significantly influence the future of the industry by equipping emerging professionals with the tools to navigate complexity, think systemically, and act responsibly. This necessitates the development of curricula that foreground sustainability, systems thinking, and social justice, while encouraging students to question dominant industry norms and engage with the ethical implications of their work. In this context, the ECODeCK project serves as a compelling example of how educational models can evolve to support sustainability transitions. Rather than adhering to traditional pedagogical approaches, ECODeCK promotes a learning model that is experiential, action-oriented, and situated within real-world challenges. It encourages learners to approach design with criticality, considering not only the aesthetics or functionality of a product but also the environmental and social dimensions of its life cycle. Such a learning model integrates academic research with industrial application, gradually advancing learning and practice through a design-led perspective. Crucially, this educational shift must extend beyond formal training and into lifelong learning. Many professionals currently operating in the fashion industry were trained under paradigms that did not prioritize sustainability. As regulations evolve and demand more responsible practices, continuous professional development becomes essential. It enables practitioners not only to respond to external pressures but to proactively anticipate and lead sustainable transformations. Embedding these competencies within ongoing education ensures a more resilient and adaptable industry, better prepared to meet future challenges. Of course, transitioning to more responsible models is not without its complexities. It requires collaborative effort across the entire fashion ecosystem – from designers and manufacturers to retailers and consumers. Lasting change depends on a shared vision and the willingness to align practices with long-term ecological and social well-being. Companies must be held accountable for the environmental and social impacts of their operations, while consumers need support in making more informed, intentional purchasing decisions that favor quality over quantity and sustainability over trend. Ultimately, the future of

fashion manufacturing hinges on our collective ability to question and redefine the norms that have historically guided the industry. Moving toward a model that centers responsibility, longevity, and care will take time, but it is both necessary and possible. From my perspective, this shift begins with rethinking not only what and how we produce and consume, but also how we learn. Education – formal, informal, and continuous – has a central role to play in this reconfiguration. It is through learning that we gain the tools to imagine and implement a more equitable and sustainable future for fashion.

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9. Design for Systemic Change

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9.1 Introduction

The environmental, social, cultural, and economic challenges accompanying the ecological transition represent complex and wicked problems (Rittel, 1977; Buchanan, 1992; Conklin, 2007) that require systemic changes (Rittel, 1977; Buchanan, 1992; Conklin, 2007). These transformations cannot be tackled through research practices based on knowledge silos, but rather need multidisciplinary approaches, cognitive processes allowing framing complex problems, and a focus on producing systemic changes rather than solutionist impacts. This creates an overall push to overcome the conception of research as a linear process upon which applications are built and then transferred as innovation into the real world, replicating the traditional sequence of *basic research – experimentation – innovation*.

Aligned with this trend, design research has been evolving by continuously questioning the relationship between its both theoretical and practice-based nature and it is today marked by a distinct epistemology which embraces a feedback-loop process between research

and design applications (Koskinen *et al*., 2011; Manzini, 2015; Redström, 2017; Boon *et al*., 2020). It has matured into a deeply interdisciplinary research approach which positions design practice not merely as an application and transfer of knowledge, but as a fundamental means of generating it – through situated making, critical reflection, and the articulation of novel concepts.

The different perspectives introduced in this book show a pathway towards an emerging approach for enabling sustainable transition, which finds its backbone in the theory of complexity and systemic thinking, and its key driver in design, seen both as a cognitive process and a transformation steerer. They support the thesis that design, as a specific *research in action* practice, can embrace systemic thinking and inform this transition by acting as a transformative learning enabler (see Chapter 3). By drawing on the shift of design from being *artefact* centred to being focused on processes and strategies (see Chapter 4), the different contributions show how participative design practices (see Chapter 5), autopoietic creative processes (see Chapter 6) and design-driven organisational change (see Chapter 7) can promote sustainability at a systemic level. This goal is not only depicted through abstract models but then situated into real contexts where, embracing a pragmatic and embodied perspective, design can enable grounded and viable transformations through learning (Chapter 8).

9.2 Systems Theory, Complexity and Systemic Thinking

The nature of contemporary challenges has brought back from a long *winter* the focus on *complexity theory* that in fact relies on a rich history of scientific and epistemological thought that sought to understand phenomena not amenable to traditional reductionist methods (Beer, 1979; Bocchi & Ceruti, 1985). Its development is deeply rooted in the scientific debate characterising the period immediately after World War II, and more specifically in cybernetics, which was the first truly transdisciplinary scientific field, integrating mathematics, neurophysiology, economy, and anthropology. Protagonists of this early

development, many scientists, among whom Norbert Wiener, Ross Ashby, Warren McCulloch, and Gregory Bateson, studied concepts like self-organisation, connectionism, and adaptive systems, all of which are still central to complexity theory (Pizzocaro, 2004; Wąsik, 2017). Cybernetics, particularly through Ashby's Law of Requisite Variety (1956), provided a mathematical and conceptual framework for understanding complexity itself. It explained how complexity (measured as *variety*) proliferates through the interaction of system components and how organisation and control exist precisely to manage this proliferating variety (Beer, 1979). Since this moment on the study of complexity has become prominent and the problem of managing it becomes a central concern, impacting during the last decades on several domains of research as well as informing disruptive theories and technological advancements.

9.2.1 Complexity Theory and Systemic Thinking

The General Systems Theory was introduced by von Bertalanffy (1968) to offer a structured approach to the study of complexity. It moves away from previous positivistic and linear cause–effect chains, to introduce a structured way of analysing complex systems by modelling interrelationships, feedback loops, and systemic structures. Systems are conceived as open, interdependent *wholes*, that is to say organised totalities, not just the sum of their parts. They form dynamic structures that produce patterns of behaviour over time, embedding emergent properties, which allow systems to adapt to changing conditions and environments.

Systems thinking offered foundational concepts upon which complexity theory is built, applying its principles to understand dynamic, unpredictable systems composed of many interacting parts (Van der Bijl-Brouwer and Malcolm, 2020).

The theory is founded around a set of key concepts whose applications extend across disciplines, allowing the study of complexity in biology, psychology, society, and technology, marking an epistemological shift in the evolution of Western scientific thought. Essential to its framing are the notions of: *whole* over parts, distributed interactions, emerging properties, self-organization, adaptive evolution, non-linear causality, *edge of chaos* and inherent uncertainty.

First of all, like systems thinking, complexity theory emphasizes the whole over the components and focuses on their interactions. The nature of these interactions is distributed, and no single element controls the system, where a certain pattern of behavior emerges from many interconnected agents (Checkland, 1999; Barabási, 2002). In fact, a system cannot be described through inherent system-level properties because they arise from interactions among components, which tend to develop a spontaneous repetitive attern of interaction (Wąsik, 2017; Bloom, 2013).

This highlights another important element to define complex systems which rely on their tendency to self-organize. Therefore, they manage their dynamics spontaneously without central control through patterns, structures, or functions that emerge from local interactions (Kauffman, 1993).

This self-organizational capacity of complex systems is able to act creating spontaneous order among its parts, but at the same time to evolve and change in response to internal and external pressures and discontinuity. This means that the different components of a system co-evolve with their environment, shaping and being shaped by it. Moreover their adaptive nature does not follow a linear model of relationship, as the cause-effect logic would suggest, but rather a potentially disruptive one in which small changes can lead to disproportionate effects. Their interactions are in fact characterised by feedback loops (positive and negative) that generate unpredictable and emergent behaviors (Holland, 1995).

This helps to explain why complex systems thrive in a dynamic balance between stability and chaos, operating at the *edge of chaos*, where they continually avoid both the rigidity of a static, homogeneous order and the collapse into complete disorder. And also why long-term outcomes cannot be fully predicted, and uncertainty is intrinsic: it is a feature not a flaw of these systems, making them generative (Cilliers, 1998).

Building on the articulation of Complexity Theory, particularly within the context of European philosophy, a distinctive intellectual tradition emerged. Associated primarily with Edgar Morin (1977, 1984, 1992) and Jean-Louis Le Moigne (1990), this tradition goes beyond analytical modelling of systems to foreground the epistemological

dimension of complexity. Its central contribution is the notion of *systemic thinking*, conceived not merely as the process of *thinking about systems* (i.e. system thinking) but as the adoption of a *systemic worldview* that acknowledges complexity, uncertainty, and the constructed nature of knowledge. This requires a shift from a static, structural understanding of wholes to a dynamic, ecological, and reflexive perspective, in which wholes are continually reorganising and knowledge about them requires reflexivity. In systemic thinking, a whole is not only *more than the sum of its parts* (emergence), but also *less than the sum of its parts*, since components may lose autonomy when integrated. Wholes are ecological and recursive in nature: systems contain subsystems, are themselves embedded in larger systems, and co-evolve with their environments. Moreover, they exhibit a hologrammatic principle, whereby the whole is present in each part (e.g., DNA in cells), and the parts reflect the whole, following a fractal logic. Their evolution can thus be represented as a dialogical process shaped by antagonistic or complementary dynamics (order/disorder, stability/change).

The notion of systemic thinking has exerted significant influence across diverse domains of knowledge, particularly in response to the growing complexity of societal, economic, and cultural phenomena, while also informing scientific and technological development toward new paradigms.

9.2.2 Reading Sustainability Through Complexity

The interwoven nature of the artificially constructed world with the biological world has been central since the early development of complexity theory and its roots in cybernetics. Several components of this theoretical tradition were shaped by studying and mimicking biological phenomena such as recursive communication loops and the organism-plus-environment circuit introduced by Gregory Bateson in his *Steps to an Ecology of Mind* (1972). As a matter of fact, today complexity theory and systemic thinking are cornerstones in the debate on sustainability: they offer a more holistic, adaptive, and interconnected framework for understanding and addressing the *wicked problems* that threaten the viability and resilience of our social and ecological systems (Buchanan, 1992; Battistoni *et al*., 2019).

First of all, systemic thinking provides the foundational concepts for understanding sustainability by shifting the focus from individual components to the relationships and interactions that define the whole system (Pizzocaro, 2018). It pushes to move the attention from isolated solutions into strategies which enable the components of a system to merge into cohesive solutions by also accounting the goals of the whole strategy. This is shown for example, by the shift in contemporary policies for sustainability from promoting single solutions (plastic-free norms) to drawing mission-oriented goals (SDGs, EU Missions).

A second key connection between systemic thinking and viable approaches to sustainability is its conception of the world as composed of interconnected wholes, where the essential properties of a system – such as sustainability – are emergent properties arising from the relationships among its parts (Van der Bijl-Brouwer & Malcolm, 2020; Capra, 1997). A system cannot be fully understood by breaking it down into its components and studying them in isolation (Pizzocaro, 2018). Instead, it needs to be seen through a holistic perspective, where sustainability is not a characteristic of individual entities but a property of a system of resilient relationships, a form of participative intelligence oriented toward a common goal (Battistoni, Giraldo Nohra, & Barbero, 2019). For example, the health of an ecosystem depends on the complex interactions between all its living and non-living parts, not just the health of one species.

A third notion central to sustainability is autopoiesis, the attribute of living systems – which are inherently sustainable – of continuously reproducing themselves (Ehrenfeld, 2019; Beer, 1979; Maturana & Varela, 1980). This concept challenges linear, resource-depleting models of production and points toward regenerative design (Vink, 2023). For example, a systemic approach to sustainability seeks to create autopoietic, open systems that model production after nature's principles, where the output (waste) of one process becomes the input (resource) for another, thereby achieving for example, zero emissions (Battistoni, Giraldo Nohra, & Barbero, 2019).

An additional concept provided by systemic thinking to understand sustainability is homeostasis, which is the ability of a system to maintain a stable internal environment in the face of disturbances

(Beer, 1979; Buchanan, 2019). This connects directly to sustainability by providing a model for how systems (ecological, social, economic) can maintain their viability and survive (Beer, 1979; Sevaldson & Jones, 2019). A sustainable system is one that can hold its critical variables within its limits, avoiding collapse by always balancing its internal resources with the external turbulences, adapting in a way that also preserves a form of balance. For example, an ecosystem that is able to self-maintain its biodiversity (Beer, 1979).

A further systemic notion aligned to sustainability refers to wholes as ecological and recursive, as both emphasise interdependence and co-evolution between human and natural systems (Capra & Luisi, 2014). This hologrammatic principle highlights how local actions reflect and shape global dynamics, resonating with sustainability's focus on nested socio-ecological systems (Folke, 2006). Sustainability thus requires acknowledging complexity, uncertainty, and reflexivity in decision-making (Morin, 2008). This perspective moves beyond reductionist approaches, fostering resilience and adaptive capacity, harmonising the need for situated actions which account for the potential of their larger, propagating effects (Folke *et al*., 2010).

Finally, the call of systemic thinking for reflexivity highlights the need for adaptive and *learning* systems that reorganise in response to evolving internal and external conditions (Morin, 2008). This aligns with sustainability science, which emphasises reflexive governance to address uncertainty and complexity in socio-ecological systems (Folke *et al*., 2010). Adaptive learning fosters resilience, enabling systems to absorb shocks, reorganise, and continue functioning (Folke, 2006). Reflexivity thus supports sustainability by embedding continuous feedback, self-critique, and knowledge co-production in decision-making (Armitage *et al*., 2008).

9.3 Complexity, Sustainability and the Role of Design

The growing complexity of socio-technical and ecological systems demands that contemporary design itself move beyond linear and reductionist approaches. Grounding design in complexity and aligning

it with systemic thinking can provide conceptual and methodological tools to deal with uncertainty, emergence, and systemic change (Pizzocaro, 2008). In fact, design has spontaneously evolved from being an isolated technical practice of shaping artefacts into becoming a strategic and transformative enabler within different societal and organisational contexts (Carella & Zurlo, 2024). By leveraging its peculiar approaches and explicitly incorporating the dimensions of systemic thinking, today it can contribute in a powerful way to addressing complex and wicked issues (Carella *et al*., 2024).

9.3.1 Navigating Uncertainty and Change Through Design

Complexity theory and systemic thinking provide foundational categories for understanding how design can navigate contemporary uncertainty and act constructively within dynamic environments.

First, complexity challenges designers to prioritise strategies over control, as complex systems resist top-down prediction and management. They depend on bottom-up interactions among components and remain sensitive and adaptive to both internal and external changes (Morin, 1985; Pizzocaro, 2004). Consequently, effective design requires strategic navigation – through sensemaking, weak-signal detection, and the formulation of enabling rules – rather than rigid prescriptions (Pei, 2025).

Second, design in conditions of complexity entails the continuous mapping and renegotiation of boundaries. Problem framing itself becomes a design act, as boundaries are fluid and evolve through interactions that reveal new dimensions (Bar-Yam, 1997; Pizzocaro, 2004). This perspective calls for open, flexible, and dialogical approaches that acknowledge emergence, where properties arise from interactions irreducible to their parts. Prototyping, accordingly, should be understood not as the validation of fixed requirements but as a process for eliciting emergent behaviour. This positions design as a participatory practice oriented toward uncovering relationships and patterns otherwise obscured.

Third, complexity theory underscores the importance of operating at the edge of order and disorder, demonstrating that adaptive systems thrive far from equilibrium, where novelty emerges as a spontaneous creative force (Stengers, 1984; Kauffman, 1993). Navigating

such dynamics requires design to embrace uncertainty as a productive force, supporting the autopoietic and generative properties of systems. This reorients the design agenda away from stability and prediction toward imagination, resilience and adaptability.

Fourth, adopting a systemic stance demands heightened awareness of interdependencies within distributed systems of interactions and feedback loops (Ashby, 1956; von Bertalanffy, 1968). In complex organisations, any artefact or intervention must be conceived as part of a larger open system. This perspective compels designers to account for boundaries, environments, and systemic relations, thereby transforming design practice into an organisational capacity oriented toward navigating uncertainty rather than producing closed solutions.

Fifth, complexity highlights the necessity of iterative and reflexive processes, where situated actions generate unpredictable outcomes that require continuous adjustment to foster virtuous behaviours. The epistemology of complexity advocates cycles of action, observation, and reflection (Morin, 1977, 1984, 1992), aligning with the action research tradition as a systemic and practice-based approach. From this standpoint, prototyping becomes less a matter of incremental refinement and more a vehicle for systemic learning and adaptation.

Finally, positioning design within a systemic lens places it at the center of the cultural transformation required to reframe societal, economic, and educational paradigms. As a transdisciplinary and transformative learning approach, design can support the development of participatory and action-oriented educational models. Equipped with conceptual and methodological insights from complexity theory and systemic thinking, designers can both engage directly with contemporary societal challenges and act as *instructional designers*, prototyping educational experiences that enable others to embrace this cultural shift.

9.3.2 Designing FOR Complexity (i.e. for Sustainability)

Designing within complexity is supported by systemic thinking, yet it differs from designing *for* complexity (i.e., for sustainability), which entails creating systems capable of adaptation and reorganisation under changing conditions (Pizzocaro, 2004). In this context, design must not only embed the principles of systemic thinking within its pro-

cesses but also generate dynamic and resilient systems as outcomes. Pursuing sustainability, therefore, requires significant changes in the design's focus, processes, and goals.

Shifting to Strategic Design

This orientation prioritises strategies over rigid artefacts, along with the processes and networks that enable their implementation, aligning with Le Moigne's (1985) emphasis on systemic modelling. Strategic design advances sustainability by shifting attention from isolated solutions to systemic interventions that address complex socio-ecological challenges (Zurlo & Cautela, 2024). It enables organisations to frame sustainability as a long-term strategic orientation, embedding social and environmental objectives into innovation processes (Manzini, 2015). Moreover, it operates as a transformative practice, reorienting value creation toward resilience and regenerative outcomes (Buchanan, 1992). Thus, strategic design provides a methodological bridge between complexity-informed systemic thinking and sustainability-oriented transformation.

Implementing Participatory Processes

Designing for complexity requires acknowledging the significance of components and their relationships rather than focusing solely on the system as a totality. This approach transforms the role of the designer into that of a mediator who shapes relationships and a coordinator who facilitates dialogue and collaboration among diverse stakeholders (Battistoni *et al*., 2019). Such participation is essential for addressing sustainability challenges, which demand systemic and interconnected solutions developed through the involvement of all actors, while accounting for interrelations and feedback effects among the components of ecosystems.

Relying on Generative Creativity

Complex systems are said to exist *on the edge of chaos*, between perfect order and complete disorder – the zone of creativity, adaptation, and evolution. Sustainability requires navigating this space, as static, unchanging systems cannot adapt to dynamic conditions (Van der Bijl-Brouwer & Malcolm, 2020). The goal of sustainability is

not to control complexity but to achieve *competent navigation* within it, fostering resilience, generative adaptation, and the ability to reach new balances in the face of unpredictable turbulence.

Enabling Organizational Change

Complex systems possess the capacity for self-organization, whereby organized forms and behaviors emerge from the interactions of components without external control. This principle is central to sustainability: rather than imposing top-down solutions, design can create conditions that allow sustainable behaviors to emerge (Van der Bijl-Brouwer & Malcolm, 2020). For example, fostering networks and strengthening relationships that connect individuals, organizations and their linked environments enable the growth of a collective intelligence which support self-organization, resource management and resilience.

Acting Through Situated and Adaptive Approaches

Complexity theory conceives change as an ongoing process of co-evolution, in which systems and environments adapt to one another (Pizzocaro, 2004). This insight directly informs sustainability practices, which must be experimental and adaptive rather than fixed and prescriptive. Practitioners adopt evolutionary approaches, taking small, iterative steps to influence systems, learning from outcomes, and amplifying successful interventions (Vink, 2023). Such methods avoid the pitfalls of large-scale design interventions, rigid plans that often fail in complex, unpredictable contexts, while merging systems thinking with action-oriented design for sustainability.

Designing for Learning and Transformation

Recognizing that social systems are defined by human relationships and beliefs, a systemic approach to sustainability emphasizes interventions that strengthen relationships to foster learning and creativity. It also seeks to address deep-seated mental models – beliefs and assumptions – that often inhibit change, which Meadows (1999) and Senge (1990) identify as among the most powerful leverage points for system transformation.

Achieving systemic change for sustainability is fundamentally tied to grounding design in systemic thinking, with the explicit goal of designing for complexity. This requires a paradigm shift from creating static solutions to fostering dynamic, resilient, and adaptive systems capable of navigating uncertainty. Strategic design serves as the crucial bridge, translating the insights of complexity theory into actionable, transformative practices that reorient value creation toward regenerative outcomes.

This approach necessitates a move towards participatory processes, where designers act as mediators and facilitators of collaboration among diverse stakeholders. It embraces generative creativity, operating *on the edge of chaos* to enable evolution and adaptation rather than control. By fostering self-organization, design can create the conditions for sustainable behaviors to emerge from within a system, avoiding the fragility of rigid, top-down mandates. This is achieved through situated, adaptive actions – small, iterative steps that allow for learning and co-evolution with the environment.

Ultimately, designing for complexity means designing for learning and transformation, addressing the deep-seated mental models that inhibit change. It is only by embracing this holistic, relational, and evolutionary perspective that design can hope to catalyze the profound and lasting transformations that sustainability demands.

9.4 Design for Systemic Change in the ECODeCK Project

The transition towards sustainability requires fundamental shifts in organisational and societal systems, moving beyond incremental fixes to address deep-seated, complex challenges. An exploration of the intersection of systemic thinking and strategic design reveals a critical framework for enabling such sustainable transformations. While systemic thinking provides the theoretical lens to understand the interconnected, dynamic nature of sustainability problems, strategic design offers an actionable, participatory, and future-oriented approach to navigate this complexity and drive meaningful change.

The ECODeCK project articulates how design can be operationalised as a strategic and regenerative engine for organisational change. By integrating participatory methods, fostering transformative learning, and grounding interventions in situated, contextualised actions, strategic design can catalyse the micro-level shifts in mindset and practice necessary for macro-level systemic transformations.

9.4.1 Design as a Strategic and Participative Approach

The ECODeCK project embodies the principles of strategic design to drive sustainable transformation by directly addressing the link between systemic thinking and sustainability (see Chapter 4). It moves beyond viewing design as a tool for product development, recasting it as a strategic and cognitive approach to navigate the complexities of sustainability.

In line with systemic thinking, ECODeCK adopts a multi-level perspective targeting individuals, organizations, and the broader ecosystem. This systemic scope aligns with the view of strategic design as a practice that redefines systems and addresses wicked problems (Buchanan, 1992; Pei, 2025). The project operationalises this by acting as a catalyst for change across interconnected levels, aiming to reorient value creation toward resilience. It seeks to cultivate a shared vision and direction, leveraging narrative frames to align stakeholders and foster a coherent organisational culture, especially during a transformation (Zurlo, 2014).

Furthermore, ECODeCK embraces the perspective of strategic design as a lever for innovating meaning. By embedding social and environmental objectives into innovation processes, the project supports companies in challenging established interpretations and proposing new visions that resonate with the sustainable transition (Verganti, 2009, 2020). It empowers individuals with competencies like systems and future thinking, enabling organisations to anticipate futures rather than merely react to them.

By facilitating inter-organisational collaboration, the project exemplifies strategic design as a practice that manages complexity and aligns stakeholders to generate shared value. This focus on co-creation and stakeholder participation is critical for driving systemic change (Pei, 2025).

Building on the understanding of ECODeCK as a strategic design initiative, the project further operationalises its goals through a deeply embedded participatory design perspective (see Chapter 5). This approach is not merely a method but a foundational principle for driving sustainable transformation, recognising that such change must be co-created rather than imposed.

ECODeCK embraces the core tenets of participatory design by reframing the designer's role from a sole creator to a mediator and facilitator of collaboration among diverse stakeholders (Battistoni *et al*., 2019). This aligns with the systemic view that sustainability is an emergent property of a system's resilient relationships, not a characteristic of isolated components (Van der Bijl-Brouwer & Malcolm, 2020). The project moves beyond professional-led solutions to include communities and users as active co-designers, acknowledging the value of their lived experience and local knowledge in tackling complex challenges (Manzini, 2015; Sanders & Stappers, 2008).

ECODeCK embeds this participatory ethos through its multi-level engagement strategy. At the individual level, it fosters key sustainability competencies like systems thinking, collaboration, and ethical reasoning through experiential and transdisciplinary learning environments (Wiek *et al*., 2011; Schäpke *et al*., 2018). At the organisational level, it prompts companies to activate cross-functional collaboration, making participation a core part of their sustainability strategy. At the ecosystem level, ECODeCK creates infrastructures for dialogue and collective experimentation, building shared understanding across firms and sectors.

Crucially, the project's methodology is iterative, adaptive, and context-sensitive, acknowledging that participation is a situated and negotiated process shaped by specific power relations and cultural narratives (Bødker, 2000; DiSalvo, 2013). By using tools like mapping and scenario building in real-world settings, it ensures that solutions are grounded in collective ownership and responsive to emerging insights. Ultimately, ECODeCK shows that participatory design is a strategic practice for building long-term capacity for collaborative transformation, making it an engine for inclusive innovation and systemic resilience.

9.4.2 Design as a Re-Generative and Organizational Engine

Systemic thinking in sustainability seeks to create autopoietic, or self-reproducing, systems that mimic nature's regenerative cycles (Ehrenfeld, 2019; Beer, 1979; Maturana & Varela, 1980). This approach challenges linear, resource-depleting models and points toward regenerative design where waste from one process becomes a resource for another (Vink, 2023; Battistoni, Giraldo Nohra, & Barbero, 2019). Generative creativity thrives in this complex space, which exists *on the edge of chaos*, where adaptation and evolution occur. Rather than controlling complexity, this perspective aims to competently navigate it, fostering resilience and adaptation to unpredictable conditions (Van der Bijl-Brouwer & Malcolm, 2020).

Creativity, in this context, becomes a collective responsibility to regenerate the health of human and natural communities, moving beyond minimising harm to actively restoring ecosystems. It is not just an individual act (Amabile, 2012; Runco & Jaeger, 2012) but a social and cultural process rooted in bottom-up emergence and self-organisation, similar to how natural systems evolve (Csíkszentmihályi, 1999).

The ECODeCK project embodies this perspective by translating these principles into a practical model for moving manufacturing systems towards sustainability (see Chapter 6). It demonstrates a participatory and co-creative approach through its three-stage regenerative creative process: Building Commitment, Designing the Shift, and Embracing the Shift. This framework promotes shared visioning, collaborative change-making, and collective reflection, which are central to participatory design and generative creativity.

ECODeCK's training model utilises immersive, emotionally resonant experiences to activate both cognitive and affective engagement. By doing so, it cultivates the core components of regenerative creativity: a future-oriented imagination to navigate complexity, a systemic, more-than-human perspective that acknowledges our entanglement with living systems, and the nurturing of values like empathy and care to guide creative intentions.

ECODeCK treats regenerative creativity as a *living, evolving practice*, shifting participants from isolated creators to relational agents of change capable of contributing to more life-affirming futures.

Leveraging on (re)generative creativity, ECODeCK project functions as a catalyst for sustainable transformation by also enabling organisational change (see Chapter 7).

Systemic thinking informs this perspective by highlighting homeostasis, the capacity of a system to maintain stability and viability by balancing internal resources with external disturbances (Beer, 1979; Buchanan, 2019; Sevaldson and Jones, 2019). Rather than imposing top-down solutions, design for change creates conditions that allow sustainable behaviors to emerge through self-organization (Van der Bijl-Brouwer & Malcolm, 2020). This is crucial for navigating the complexity of cultural change, which is often slow, nonlinear, and deeply embedded within an organization's political and emotional dynamics (Alvesson & Sveningsson, 2015).

The ECODeCK project embraces this by acting as a transformative force that reframes organizational culture through design (Buchanan, 2015). It operationalizes a bottom-up approach, focusing on individuals as the primary agents of change. The project's core contribution is a design-based educational model grounded in Transformative Learning Theory (Mezirow, 2003; Taylor, 2000). This model uses participatory and human-centered methods like co-design and experiential learning to trigger shifts at the micro-level – influencing individual mindsets, creativity, and decision-making (Miner, 2006; Cummings, 1978).

By equipping employees with a competence framework, ECODeCK empowers them to integrate sustainable values into daily practices. These micro-level transformations can then ripple outward to influence group (meso) and organisational (macro) behaviours, reconfiguring the company's "underlying assumptions" (Schein, as cited in). In the context of the Italian manufacturing sector, which often faces cultural resistance and inertia (Musso *et al*., 2024), ECODeCK does not impose change but invites it. It creates space for new conversations and shared purpose, enabling employees to see themselves as co-authors of a shared, sustainable future.

9.4.3 Design as an Actionable and Transformational Process

The ultimate goal of ECODeCK project is being able to promote sustainable transformations in real contexts, especially the sectors

(i.e. fashion) which most negatively impact environmental protection, societal development and cultural preservation (see Chapter 8).

Systemic thinking highlights how local actions reflect and shape global dynamics (Capra & Luisi, 2014), emphasising that sustainability requires harmonising situated actions with their larger, propagating effects (Folke *et al*., 2010; Folke, 2006). This aligns with a pragmatist view of design, which sees social systems as composed of the repeated bodily activities, or habits, of people in continuous transaction with their environment (Dewey, 1934; Mead, 1934; Vink, 2023). Change, from this perspective, is not imposed by expert designers but emerges from collective reflexivity and the intentional shaping of social systems that occurs in everyday life (Vink, 2023; Mead, 1934). This avoids the pitfalls of rigid, large-scale plans, favouring instead small, iterative steps that amplify successful interventions (Vink, 2023; Pizzocaro, 2004).

The ECODeCK project embraces this perspective by reframing sustainability as a creative and professional identity cultivated through practice, not imposed from the outside. It avoids prescriptive, one-size-fits-all solutions, instead providing tools that support incremental, situated learning through applied research and collaboration. Its educational model bridges the gap between abstract theory and the day-to-day industrial reality of the manufacturing sector.

Rather than promoting an *expert-led* model of change (Vink, 2023), ECODeCK focuses on cultivating holistic competencies – a blend of knowledge, skills, and values – that empower individuals to act with purpose in uncertain contexts. The project's frameworks, such as the Sustainable Transition Competence Framework (ST Comp), are designed to be integrated into workplace learning, embedding sustainability into the operational DNA and daily routines of firms. By fostering these embodied habits and reflexive practices at the individual level, ECODeCK enables a bottom-up transformation where employees become agents of change, capable of redesigning the very systems that shape them (Bertola & Colombi, 2021). This approach ensures that change is not just visionary but implementable and scalable within a specific context, fostering autonomous design where communities can change their own norms from within (Escobar, 2018).

Aiming at promoting this situated-action approach to sustainable transformation, the ECODeCK project's core mechanism is its explicit adoption of transformative learning (see Chapter 3).

Systemic thinking calls for reflexive, adaptive, and *learning* systems that can reorganise in response to complexity and uncertainty, which is essential for sustainability (Morin, 2008; Folke *et al*., 2010). This requires moving beyond technical fixes to address the deep-seated mental models and "problematic frames of reference" that underpin unsustainable behaviours (Meadows, 1999; Senge, 1990; Mezirow, 2003). True sustainability, therefore, depends on transforming our assumptions to be more "inclusive, discriminating, open, reflective, and emotionally able to change" (Mezirow, 2003).

The ECODeCK project embraces this perspective by designing an educational experience grounded in Transformative Learning Theory (Mezirow, 2003). It rejects a transmissive model of education, where knowledge is simply transferred, in favour of a socio-constructivist approach where learners actively co-construct knowledge and skills through experience, reflection, and social interaction. This positions learners as active, participatory agents of change rather than passive recipients (Jickling & Wals, 2008).

The ECODeCK's learning model is intentionally designed to be constructive, as learners build knowledge through direct experience and interaction; collaborative, as knowledge is built socially through dialogue and shared experiences; self-regulated, as learners manage their own learning process through cycles of action and reflection; situated as learning occurs within a specific context, making it relevant and applicable.

By focusing on critical reflection and critical self-reflection, the project aims to do more than just teach new skills (instrumental learning); it facilitates a more profound shift in participants' worldviews (communicative learning) (Mezirow, 2003). This process is central to transforming the *black box* of an individual's or organisation's assumptions, which is a key leverage point for systemic change (Beer, n.d.). Ultimately, ECODeCK is designed not just to inform but to transform, empowering individuals to question taken-for-granted beliefs and co-author more viable, sustainable futures.

9.5 Conclusions

The contemporary challenges of sustainability can be interpreted through the lens of the so-called wicked problems that defy traditional, reductionist approaches, demanding instead systemic changes. The theoretical frameworks of complexity and systemic thinking, which have evolved from early cybernetics to provide a rich understanding of non-linear, adaptive, and emergent systems, offer a crucial epistemological foundation for addressing these challenges. They shift the focus from isolated components to interconnected wholes, from linear causality to feedback loops, and from predictable control to navigating inherent uncertainty. This worldview is essential for understanding sustainability not as a static property of individual parts, but as an emergent quality of resilient and adaptive socio-ecological systems.

This theoretical evolution has profound implications for the field of design, which has itself moved from an artefact-centred practice to a strategic and process-oriented discipline capable of steering transformation. To effectively address complex issues, design must be grounded in the principles of complexity and systemic thinking. This grounding provides the conceptual and methodological tools to navigate uncertainty, prioritise strategies over rigid prescriptions, and operate at the *edge of chaos* where novelty and adaptation emerge. It reframes design as a *research in action* practice that generates knowledge through situated making and critical reflection.

However, the imperative for design goes beyond simply shaping its processes according to systemic principles; it must also aim to create *for* complexity as its output. This means the goal is not to produce static solutions, but to design and foster dynamic, resilient, and adaptive systems capable of reorganisation and learning. Such an approach prioritises strategies over artefacts, implements participatory processes to build collective intelligence, and enables self-organisation so that sustainable behaviours can emerge from within a system rather than being imposed.

The ECODeCK project serves as a compelling case study of this paradigm in action, operationalising strategic design as a regenerative engine for organisational change toward sustainability. By

integrating participatory methods, generative creativity, and transformative learning, ECODeCK does not offer a fixed solution but rather a framework for building capacity. It addresses deep-seated mental models through situated and adaptive interventions, catalysing the micro-level shifts in mindset and practice that are essential for macro-level systemic transformation. In doing so, it exemplifies how grounding design in systemic thinking and aiming to design *for* complexity provides an actionable pathway toward co-authoring more viable and sustainable futures.

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The urgent need for sustainable transformation calls for innovative approaches that integrate design as a strategic force for systemic change. *Designing the Transition* explores how design can build capacities for individuals, organizations, and ecosystems, enabling them to navigate the complexities of sustainability transitions. Structured in two parts, the book first introduces the *ECODeCK* project, a design-driven capacity-building model developed to support sustainable transitions in the manufacturing sector. This section outlines its theoretical underpinnings, including the Sustainable Transition Competence framework and the role of design in transformative learning. The second part articulates seven key design perspectives, each addressing a critical dimension of sustainability: participatory action, collaborative systems, regenerative creativity, organizational culture, circular manufacturing, learning processes, and systemic change. These perspectives illustrate how design can facilitate innovation, cultural shifts, and strategic interventions across different levels, from individual behaviours to broader systemic transformations, positioning design not only as a problem-solving tool but as a mindset capable of enabling transitions toward a more resilient and sustainable future.

FrancoAngeli
La passione per le conoscenze